

PUSH-BUTTON SWITCH MEMBER AND ITS MANUFACTURING METHOD**Publication number:** JP2004006105**Publication date:** 2004-01-08**Inventor:** KAWAGUCHI TOSHIYUKI; HOTTA SHINJI**Applicant:** SHINETSU POLYMER CO**Classification:**

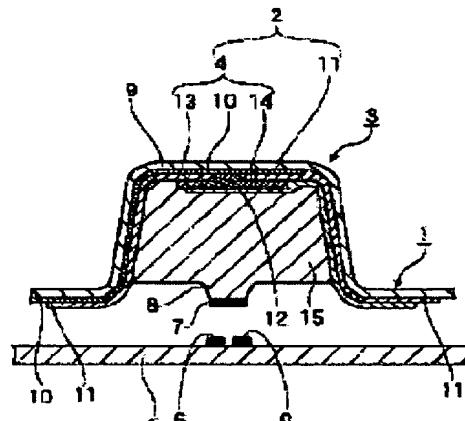
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- european:**Application number:** JP20020159678 20020531**Priority number(s):** JP20020159678 20020531**Report a data error here****Abstract of JP2004006105**

PROBLEM TO BE SOLVED: To provide a push-button switch member capable of coping with a light, thin, small, high dense and diversified portable terminal, whereby sufficient insulation between the conductor of a transparent electrode and the conductor of a back plate can be secured, and a display part uniformly emitting light can be efficiently obtained, and to provide its manufacturing method.

SOLUTION: This push-button switch member has a plurality of keytop parts 3 to press a movable contact 7 disposed face to face with a fixed contact 6 on a circuit board 5 in the direction to bring it into contact with the fixed contact 6, and a cover base material to mount the keytop part 3 onto the circuit board 5 by disposing it at a prescribed position, and it has a display part 2 to display identification functions or switch functions, and a surface emitter 4 integrally built in the display part 2. The surface emitter 4 has a light emitting layer 13 between a transparent electrode 10 and a back plate 14, and an insulating printed layer 26 is interposed at the position where a conductor T connecting to the transparent electrode 10 and a conductor H connecting to the back plate 14 are superimposed.

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CLAIMS

[Claim(s)]

[Claim 1]

Two or more keytop sections for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact. It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section It is the member for a push button switch which has the field illuminant of one in the display which displays a discernment function or a switch function, and this display. Said field emitter is a member for a push button switch characterized by being placed between the parts with which the conductor which has an emitter layer between a transparent electrode and a back plate, and stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap by the insulating layer.

[Claim 2]

Said two or more keytop sections are members for a push button switch according to claim 1 characterized by being formed in the flat part of said base material film which connects the keytop sections which the stress cutoff section which prevents telling the stress of said base material film produced when it is prepared in the base material film which has one insulation at one and any one keytop section is operated to other keytop sections adjoins.

[Claim 3]

The thickness of said insulating layer is a member for a push button switch according to claim 1 or 2 characterized by being at least 10 micrometers or more.

[Claim 4]

The member for a push button switch according to claim 3 characterized by the insulating empty capsid containing at said insulating layer.

[Claim 5]

The member for a push button switch according to claim 3 characterized by having made said base material film penetrate, having wired the side on the other hand from the one side side in one conductor in the part with which the conductor which stands in a row in said transparent electrode, and the conductor which stands in a row in a back plate lap, and making this base material film into said insulating layer.

[Claim 6]

the manufacture approach of the member for a push button switch characterize by carry out size enlargement of the electrode terminal which be the manufacture approach of claim 1 thru/or the member for a push button switch any one publication of five , form the conductor which be connect with said transparent electrode and an emitter layer on said plane base material film , and be connect with said transparent electrode in a back plate list , and the conductor which stand in a row in a back plate , and can be connect with the keytop section and an external electrode after that .

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[Translation done.]

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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

## [Field of the Invention]

This invention is used for input devices, such as personal digital assistants, such as a cellular phone and PDA, telephone, a car stereo, a board computer for mount, an audio, a measuring instrument, a personal computer, and remote control for home theaters, and relates to the member for a push button switch and its manufacture approach of the illumination type which can begin to illuminate a display in more detail in a dark place about the member for a push button switch which has the display which displays each switch function on the keytop section of this input device.

[0002]

## [Description of the Prior Art]

Conventionally, the so-called illumination function in which the member for a push button switch used for this kind of input device illuminates the display which showed the function of a push button switch in the activity at the time of night is needed.

[0003]

For example, it is incorporated in the case of the input device made into the object, and enables it to realize the switch function of the push button switch 30 with the push button switch 30 used for input devices, such as a portable telephone, after the covering base material 32 and the circuit board 33 which formed in one two or more keytop sections 31 which constitute an actuation key have faced each other as shown in drawing 8 or drawing 9. and in the top panel section of the becoming [ each actuation key ] keytop section 31, or the rear-face section, so that the function of the push button switch 30 may be known even in a dark place. The display 34 which gave patterns, such as the alphabetic character and sign according to each switch function, or a pattern, is formed. The content of a display of a display 34 emerges and it can check by looking now because the reflected light which the direct solar radiation emitted from the light source of LED35 or electric bulb 36 grade established on the circuit board 33 and this direct solar radiation reflect and produce in a surrounding member penetrates in the top panel section from the rear-face section of the keytop section 31. Thereby, a cellular phone etc. can be used convenient also in the time of night.

[0004]

Moreover, when more uniform brightness was required, as shown in drawing 10 or drawing 11, the light guide section material 37 on sheet metal was inserted between LED35 and the keytop section 31, and to enlarge luminescence surface area by using the EL (electroluminescence) sheet 38 which carries out field luminescence as the light source was tried.

[0005]

However, the light guide section material 37 which draws the direct solar radiation from the light source and the light source of LED35, an electric bulb 36, and EL sheet 38 grade Since it is arranged in the place distant from the keytop section 31 so that contact actuation with the contact surface 39 on the circuit board 33 and the keytop section 31 may not be checked. It becomes the physical relationship which the light sources 35, 36, and 38, the light guide section material 37, and a display 34 left. If it is when carry out, it compensates the light guide section material 37 or the EL sheet 38 is used, an increase and, the number of LED35 or electric bulbs 36. The case where sufficient quantity of light which checks the content of a display of a display 34 in a dark place could not be supplied although the difficulty of the design by components mark increasing becomes high arose, and it was lacking in the effectiveness.

[0006]

If it was in the portable telephone which carries out cell actuation especially, the low power is called for, to secure sufficient quantity of light by a small number of light sources was desired, but by the conventional approach mentioned above, even if a part of light emitted from the light source could contribute on the check-by-looking disposition of a display 34 but it used big power consumption, conflict that it could not improve had produced visibility.

[0007]

Furthermore, weight increase was to be caused while constraint arose to be unable to make thickness of the push button switch 30 thin, as a result make thin thickness of an input unit or the body of a device, in order to form the light sources 35, 36, and 38 and the light guide section material 37 between the keytop section 31 and the contact surface 39 prepared in the fixed substrate 33 corresponding to this.

[0008]

## [Problem(s) to be Solved by the Invention]

Then, in order to cancel the above nonconformities, that to which the device which prevents diffusion of light and loss of the quantity of light by the obstruction by preparing the field emitter which carries out spontaneous light to the top panel section of the keytop section like invention indicated by JP,11-232954,A or JP,2000-285760,A, and attaching the light source near the display is performed is known. These fabricate a keytop configuration, after forming the display layer and transparent electrode with which patterns, such as an alphabetic character, a sign, or a pattern, were given to the insulating bright film, an emitter, a dielectric, and a back plate.

[0009]

More specifically, a transparent electrode forms tin oxide INJIU, the thing which formed the ceramic layer for tin oxide or antimony oxide tin by ion sputtering etc. or the transparent conductive ink which carried out distributed mixing of the ceramic powder at

transparence insulation resin, and a still more transparent conductive polymer by screen-stencil etc. on a transparence insulation film. In order to obtain efficient luminescence using a silver paste, or carbon paste or a conductive polymer paste, the conductor which stands in a row in each electrode is prepared in a back plate, and it is compensated with conductivity so that sag from a feed terminal to a light-emitting part may not be caused.

[0010]

However, if it was in the member for a push button switch which has a field illuminant near this conventional display, there was a problem that the insulation of environmental stability, the conductor which stands in a row under highly humid especially at a transparent electrode or it, and the conductor which stands in a row in a back plate or it fell.

[0011]

Therefore, the artificer of this invention proposed it being arranged on the flat surface where both differ, and making it not lap from this invention before except the light-emitting part.

[0012]

However, it was physically difficult to wire from small-and-light-izing of the personal digital assistant of these days, densification, and diversification, so that the conductor of a transparent electrode and the conductor of a back plate may not lap, therefore it was difficult to maintain the insulation of a transparent electrode and a back plate, and the problem that it was difficult to acquire good luminescence quality was connoted.

[0013]

Then, it thinks in order to solve the problem of the member for a push button switch of having a field illuminant near the above conventional displays, and sufficient insulation of the conductor of a transparent electrode and the conductor of a back plate is secured, the display which carries out uniform luminescence is obtained efficiently, and this invention makes it the technical problem to offer the member for a push button switch which can respond also to small-and-light-izing of a personal digital assistant, densification, and diversification, and its manufacture approach.

[0014]

[Means for Solving the Problem]

In order to solve the above-mentioned technical problem, invention according to claim 1 Two or more keytop sections for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact. It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section It is the member for a push button switch which has the field illuminant of one in the display which displays a discernment function or a switch function, and this display. Said field emitter has an emitter layer between a transparent electrode and a back plate, and it is characterized by being placed between the parts with which the conductor which stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap by the insulating layer.

[0015]

the member which had the thickness which has insulation with the insulating layer here — meaning — either of the independent or multiple ingredients — so-called — you may be .

[0016]

invention according to claim 2 — the configuration of claim 1 — in addition, it is characterized by to be formed in the flat part of said base material film which connects the keytop sections which the stress cutoff section which prevents said two or more keytop sections telling the stress of said base material film produced when it is prepared in the base material film which has one insulation at one and any one keytop section is operated to other keytop sections adjoins.

[0017]

In addition to claim 1 or the configuration of 2, invention according to claim 3 is characterized by the thickness of said insulating layer being at least 10 micrometers or more.

[0018]

In addition to the configuration of claim 3, invention according to claim 4 is characterized by the insulating empty capsid containing at said insulating layer.

[0019]

invention according to claim 5 — the configuration of claim 3 — in addition, in the part with which the conductor which stands in a row in said transparent electrode, and the conductor which stands in a row in a back plate lap, in one conductor, said base material film is made to penetrate, on the other hand, a side is wired from an one side side, and it is characterized by making this base material film into said insulating layer.

[0020]

invention according to claim 6 be characterize by carry out size enlargement of the electrode terminal which form the conductor which stand in a row in claim 1 thru/or the conductor which be the manufacture approach of the member for a push button switch one publication 5 either , be connect with said transparent electrode and an emitter layer on said plane base material film , and be connect with said transparent electrode in a back plate list and a back plate , and can be connect with the keytop section and an external electrode after that .

[0021]

[Embodiment of the Invention]

Hereafter, drawing 1 thru/or drawing 7 explain the gestalt of implementation of this invention.

[0022]

[The gestalt 1 of implementation of invention]

Drawing 1 is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[0023]

The member 1 for a push button switch concerning the gestalt 1 of operation shown in drawing 1 consists of the encaustic sections, such as an alphabetic character, a sign, or a pattern, and a background of those, forms the display 2 to which the either emits light at least in the top panel section side of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0024]

The traveling contact 7 which is made to counter the stationary contact 6 on the circuit board 5, and is arranged is formed in the member 1 for a push button switch. A traveling contact 7 is specifically formed at the head of the press projected part 8 prepared in the center of the rear-face section of the keytop section 3, and the traveling contact 7 enables it to contact to a stationary contact 6 by pressing the keytop section 3 to a circuit board 5 side.

[0025]

It is the periphery section of the keytop section 3. Moreover, between the member 1 for a push button switch, and the circuit board 5 When the covering base material (not shown) of spring materials, such as silicone rubber which formed in one two or more keytop sections 3 allotted to the position, is formed and the keytop section 3 is pressed, some covering base materials carry out elastic deformation to a circuit board 5 side. When a hand is lifted from the keytop section 3, the keytop section 3 enables it to return to the original location according to the elastic stability of a covering base material.

[0026]

Two or more keytop sections 3 are arranged at the member 1 for a push button switch, it has the complicated configuration of a three dimension from viewpoints, such as human engineering, in many cases, the top panel section of the keytop section 3 serves as the configuration where it upheaved from parts other than keytop section 3, and it projects from opening (not shown) prepared in the case of an input unit. As for a display 2, that with which patterns, such as a figure, an alphabetic character, or a pattern, are adopted, and indicate the discernment function of the keytop section 3 or the switch symbol description of the keytop section 3 to be is used. Although these displays 2 are identified according to the color difference of for example, an alphabetic character color (encaustic section) and background colors other than an alphabetic character (ground section), a hue with sufficient visibility will be chosen if needed.

[0027]

The ingredient with which it fills up as a core material 15 which forms the plunger section etc. is chosen from hard or elastic resin and an elastomer, thermoplasticity, thermosetting, a pellet type, or liquefied \*\* — although the description is not limited, liquefied thermosetting resin is easy to pour in and excellent in respect of the moldability. Injection molding, transfer molding, potting, etc. can perform in formation of the plunger section etc., and it is also possible to it to paste up and prepare what was fabricated beforehand.

[0028]

The transparency insulation film 9 which is a base material film is covered by the periphery front face of the member 1 for a push button switch except the rear-face section of the keytop section 3, and the transparent electrode 10 used as one electrode of the field emitter 4 is formed in it in the rear face of this transparency insulation film 9 in the range which reaches the top panel section of the keytop section 3 from the side face of the keytop section 3. The opaque coloring layer 11 which has protection-from-light nature and insulation is formed in the rear face of the transparency insulation film 9 in which the rear face of a transparent electrode 10 and the transparent electrode 10 are not formed.

[0029]

And the cutting die section 12 doubled with gestalten, such as an alphabetic character of a display 2, a sign, or a pattern, is formed in the opaque coloring layer 11. The emitter layer 13 of magnitude slightly smaller than the magnitude of the top panel section of the keytop section 3 including the cutting die section 12 is formed in the rear face of the opaque coloring layer 11. Therefore, the cutting die section 12 will be fill uped with the emitter layer 13, the pattern [ that it consists of an alphabetic character, a sign, or a pattern ] section will be formed, and the design of a display 2 will be completed by the background (ground section) which consists of an opaque coloring layer 11 around this encaustic section and the cutting die section 12. And the back plate 14 which forms another electrode is formed in the rear face of the emitter layer 13.

[0030]

Drawing 2 is the important section expanded sectional view which expanded the top panel section of drawing 1.

[0031]

The transparency coloring layer 16 is contacted and formed in the opaque coloring layer 11, and a part of transparency coloring layer 16 is burying the cutting die section 12 of the opaque coloring layer 11. The anchor coat layer 17 is formed in the rear face of the transparency coloring layer 16, and he is trying to raise the adhesion of the transparency coloring layer 16 and a transparent electrode 10. The anchor coat layer 17 can be omitted when there is a function which raises adhesion with a transparent electrode 10 to the transparency coloring layer 16.

[0032]

the conductor which stands in a row in a back plate 14 in order that it may be made not to make a transparent electrode 10 large beyond the need and it may maintain the insulation with a back plate 14 — as for H, forming is important so that it may not lap. Between a transparent electrode, 10, and a back plate 14, the emitter 18 and dielectric layer 19 which consist of luminescent material are pinched. It is necessary to form an emitter 18 and a dielectric layer 19 so that a transparent electrode 10 may be covered from the need of maintaining the insulation of a transparent electrode 10 and a back plate 14, in the part with which a transparent electrode 10 and a back plate 14 lap.

[0033]

Although there is a display 2 in the top panel section of the keytop section 3, and this display 2 is not distorted with shaping or is not extended, the part of the side face of the keytop section 3 is most extended by shaping, therefore, the conductor which stands in a row in the conductor T which stands in a row into the part of the side face of the keytop section 3 at the circumference edge of each class, and a transparent electrode 10 and it and a back plate 14, and it — if there is a part with which H laps, since exfoliation and an open circuit may arise, it must avoid. Moreover, in order to avoid the unexpected open circuit by dispersion in shaping etc., or lifting of resistance, it is very desirable at the stability of luminescence for a transparent electrode 10 and a back plate 14 to boil two or more electric conduction circuits as a redundancy circuit, respectively, and to connect in the direction of a normal mostly.

[0034]

The polyvinyl alcohol whose thickness of the transparency insulation film 9 is about 25~500 micrometers, Polyethylene, polybutylene, polyethylene terephthalate, polyethylenenaphthalate, Polybutylene naphthalate, the poly acrylic, a polycarbonate, polystyrene, Poly FURORO ethylene propylene, poly chloro TORIFURORO ethylene, the poly vinylidene, Polyimide, polyamidoimide, polyether sulphone, polysulfone, Double \*\*\*\* which carried out the lamination of several sorts besides denaturation objects, such as polyphenylene sulfide,

a polyamide, polyarylate or a styrene system, a polyester system, a polyamide system thermoplastic elastomer, and those copolymerization objects, an alloy, of films can be used.

[0035]

Moreover, 100–200 degrees C of softening temperatures when formation of a keytop configuration is easy of 50–150-degree C resin are preferably good, and the small thing of gas transparency of the transparence insulation film 9 is desirable. After shaping, forming inorganic oxides, such as oxidization silicon and an aluminum oxide, outside as a gas barrier layer by approaches, such as vacuum deposition and a sol gel process, or forming overcoat layers, such as transparence resin, protect the design of the emitter layer 13 or a display 2, and they are desirable for reinforcement.

[0036]

The transparence coloring layer 16 and the opaque coloring layer 11 have that good which uses elastic resin and an elastic elastomer as a binder, is what mixed the color and the pigment, sticks to the transparence insulation film 9, and is similarly ductile, and it is desirable to use the same resin. Although the thickness is set to 1–20 micrometers, it is 3 micrometers or more which is easy to prepare by printing etc., and since it is easy to fabricate the one where overall thickness is thinner, 10 micrometers or less are desirable.

[0037]

Into the ingredient used for a transparent electrode 10, polyacetylene, poly para-phenylene, Polypyrrole, the poly thiophene, the poly aniline, polyphenylene vinylene, Poly seleno FEN, the poly azulene, the poly pyrene, the poly carbazole, The polyethylene dioxythiophene which introduced substituents, such as the poly pyridazine, poly naphthylene, the poly fluorenes, those alkylation, and alkoxylation, Poly thienylene vinylene, Pori (3 methylthiophene), Pori (3, 4-dimethylthiophene), Pori (3-thiophene-beta-ethane sulfo nail), the poly methyl pyrrole, Conjugated-system conductive polymers, such as Pori (it is a KISHIRU pyrrole to 3), Pori (3-methyl-4-pyrrole carboxylic-acid methyl), poly cyano phenylenevinylene, a poly dimethoxy phenylenevinylene derivative, or a polyisoprene conversion object, are mentioned.

[0038]

Among these, although it has the influence of a dopant, it is extremely stable to oxygen or humidity, and it is transparent and polypyrrrole and the poly thiophene with high conductivity, and the poly aniline derivative are desirable.

[0039]

Since resistance sufficient in a conductive polymer simple substance cannot be obtained, it is necessary to dope. As an acceptor, halogens, such as iodine and a bromine, PF5, AsF5, the Lewis acid of BF3 grade, HF, HCl, proton acid and Para toluenesulfonic acid of H2SO4 grade, Organic acids, such as PARAMETOKISHI ethyl toluenesulfonic acid, FeCl3, the transition-metals compound of TiCl4 grade, Alkaline earth metal, such as alkali metal as an organic substance or donors, such as tetracyano dimetan, tetracyano tetraaza naphthalene, and chloranil, such as Li, Na, and K, and calcium, Sr, Ba, etc. is mentioned.

[0040]

In order to raise the stability by temperature and humidity, an electrolyte anion and a cation are avoided, caution is required for a dedope and coordinate bond, copolymerization, etc. with a conductive polymer are [ it is / direction / good and ] an effective approach to immobilization. Especially the thing for which the monomer of AB2 mold is used as a start raw material, and is introduced into oligomer, such as DIN DORIMA which was made to carry out sequential association and was compounded from the core molecule, polystyrene, polymethylmethacrylate, and polyurethane, a polymer, or a fullerene molecule, and a dopant is supported as a functional group is simple, and it is especially desirable from the adhesion to a transparence insulation Plastic solid or a film increasing. Moreover, since the dopant which became many organic functions focusing on such support also becomes carrying out the bridge of between the molecules of a conductive polymer, stabilizing in electric conduction, and lowering resistance, it is dramatically useful. It is better to make it store into a Plastic solid, since the effect of a dedope becomes very small where a conductive polymer is closed.

[0041]

Furthermore, in order to reduce conductivity, a conductive polymer is extended, it is useful to contract the intermolecular distance of a conductive polymer, and it can use the drawing at the time of size enlargement.

[0042]

what formed the ceramic layer for a tin oxide indium, tin oxide, or antimony oxide tin by ion sputtering etc. as other ingredients of a transparent electrode 10 -- or

Although the transparent conductive ink which carried out distributed mixing of the ceramic powder at transparence insulation resin is mentioned, when drawing shaping is carried out at a keytop configuration, the treatment of compensating the fault is required by mixing detailed conductive fiber so that resistance may not go up. Since a conductive polymer maintains conductivity until it fractures, it is convenient to this invention accompanied by drawing shaping.

[0043]

If the structure of the emitter layer 13 makes the field of a display 2 emit light to homogeneity and considers compound-ization with the Plastic solid of resin that what is necessary is just to use the mechanism of electric-light conversion, inorganic [ of an organic system / EL ], organic electroluminescence, or LEC (LightEmittingElectrochemicalCell, electrochemical luminescence) is mentioned, also in this, thickness control is easy, there is stability over an environment, and inorganic [ simple / EL ] is suitable.

[0044]

One side [ at least ] which counters forms the about 5–50-micrometer emitter 18 among 2 electrodes (a transparent electrode 10 and base electrode 14) of transparence, and inorganic [ EL ] impresses an alternating current (20–100V, and 50–400Hz), and makes it emit light. It is necessary to carry out pressure up in the case of direct-current cells, such as a pocket device, and to change into an alternating current with an inverter etc.

[0045]

An illuminant 18 can make high dielectric organic substance binders, such as cyanoethyl cellulose, cyano ethyl saccharose, a cyano ethyl pullulan, and cyano ethyl vinyl alcohol, able to distribute inorganic fluorescent substance powder, such as zinc sulfide, can be solution-ized by the acetonitrile, dimethylformamide, dimethylacetamide, etc., and can be processed with wet. Especially, metals, such as copper and iron, are doped to an emitter 18, and multiple color-ization is attained. Moreover, a fluorescent substance is microencapsulated with the ceramics with a sol gel process etc., and what raised moisture resistance is known. When the adhesion and the low moisture permeability not only to luminous efficiency but a base material are searched for, it can be used suitably. In order to

paste the transparent electrode 10 which consists of an adhesive low conductive polymer good, it is desirable to use a thing equivalent to the ingredient of an anchor coat.

[0046]

High dielectrics, such as barium titanate and potassium titanate, can be further blended with the binder of a dielectric layer 19, and electric-field effectiveness can be gathered to it. In order to insulate a transparent electrode 10 and a back plate 14, both volume resistivity and thickness are important, the volume resistivity of the 13th power or more of 1 is required of DC100V impression, and at least 10 micrometers is required for thickness. If this insulation falls, since luminescence brightness will become low and luminous efficiency will fall, caution is required. Of course, there must not be no pinhole, mixing of a foreign matter, etc. If high concentration ink, such as non-solvent ink, is used, thickness will be formed at once, the pinhole by solvent volatilization etc. will decrease, and it will be easy to maintain insulation.

[0047]

Although the area of inorganic EL sheet used as a conventional source of sheet-like light is large, since this invention is adopted only as a display 2, that area is set to about 1 / 5 - 1/100, and can reduce power consumption in proportion to it.

[0048]

Although the above-mentioned conductive polymer is sufficient as a transparent electrode 10 and the back plate 14 which counters Metals, such as gold, silver, copper, nickel, palladium, and platinum, an alloy, or tungsten carbide, Others [ particles /, such as silicon carbide, tin oxide, and indium oxide, / conductive / ceramic ], Conductive fillers, such as carbon black and graphite, an epoxy resin, Since ductility becomes high, it is desirable to consider as thermoplastics with big molecular weight, such as the thermosetting resin of low crosslinking density, such as urethane resin and silicone resin, or a polyamide, polyester, the poly acrylic, chlorinated polyolefins, and unvulcanized synthetic rubber, thermoplastic elastomer.

[0049]

The storage modulus in the molding temperature of a binder is smaller than that of a base material and the insulating macromolecule thin film 20 mentioned later, and needs to be in a floating condition earlier than them, and to be extended easily. When dynamic viscoelasticity is measured, as for the storage modulus, it is still more preferably desirable that they are double or less figures a single or less figure. When there is no magnitude of sufficient sample to measure dynamic viscoelasticity, using a micro hardness tester, a sample is in the condition maintained to required temperature, and can distinguish size.

[0050]

The insulating macromolecule thin film 20 which has insulation is formed, and the rear face of the emitter layer 13 which consists of a transparent electrode 10, an emitter 18, a dielectric layer 19, and a back plate 14 is protected electrically.

[0051]

As for the conductors T and H which stand in a row in a transparent electrode 10 or a back plate 14, it is desirable that conductivity is good although the same ingredient as a back plate 14 is used, and, generally a silver paste and carbon paste are used.

[0052]

They are connected with juxtaposition through Conductors T and H, and as shown in drawing 3, in order that the conductors T and H which stand in a row in a transparent electrode 10 or a back plate 14 may maintain two or more keytop sections 3 at same electric potential and may abolish brightness unevenness, except a light-emitting part, it must try to lap in the minimum area to them so that leakage current may not arise.

[0053]

the conductor which stands in a row in a transparent electrode 10 or a back plate 14 since a limitation is in the area which takes about Conductors T and H especially — Comrades T and H will be each other interwoven with. For this reason, in order to give sufficient insulation, it is desirable to prepare an insulating layer among both in insulating ink etc. What was shown in drawing 4 is the example which adopted the insulating printing layer 26 which printed insulating ink etc. as an insulating layer as the part to which Conductor H crosses as Conductor T. Thus, attention must be paid to a pinhole when an insulating layer is formed by printing.

[0054]

a conductor — T and a conductor — both isolation distance in the part which crosses H — if it puts in another way — the thickness of the insulating printing layer (insulating layer) 26 — 10 micrometers or more — more — desirable — 20 micrometers or more — then, it is good. What is necessary is here, to use what raised an overprint or ink solid content, in constituting an insulating layer from an independent member, and also just to carry out thick film screen printing using the thing containing an insulating particle with a big particle size, for example, a glass particle, an acrylic particle, a silicone particle, a styrene particle, etc. It is convenient, especially when an insulating particle is hollow and the emitter of alternating current actuation is used from a dielectric constant falling.

[0055]

Moreover, high insulation can be secured when the transparency insulation film 9 which is a base material film which has insulation is used as an insulating layer. In this case, as shown in drawing 5, the through hole S prepared beforehand is transparency insulation minded [ 9 ]. the conductor which stands in a row in a transparent electrode 10 — T — this conductor — the conductor which stands in a row in the back plate 14 with which while is arranged, it wires and T crosses as it misses from a side to an another side side — by making the transparency insulation film 9 intervene between H the conductor with which the transparency insulation film 9 which is a base material film stands in a row in a transparent electrode 10 — the conductor which stands in a row in T and a back plate 14 — it can be made to function as an insulating layer with H

[0056]

In addition, when adopting the transparency insulation film 9 as an insulating layer, naturally the insulating layer is transparent, but since it becomes opaque by relation with the design of the keytop section 3, it is not limited to either.

[0057]

Moreover, as shown in drawing 3 or 6, when the keytop section 3 is operated, it is required to form notching 21 in the flat part of the transparency insulation film 9 which connects the keytop sections 3 and 3 which the adjoining keytop section 3 stands in a row, and it must be made not to move, therefore adjoin, and to maintain the independence of each keytop section 3. Here, when notching 21 operates any one keytop section 3, it is the stress cutoff section it is made not to get across to the keytop section 3 which the stress produced on the transparency insulation film 9 which is a base material film adjoins, and as long as it can realize the same operation, the configuration of not only this but a slit or others may be used for it.

[0058]

In formation of the opaque coloring layer 11, the transparency coloring layer 16, and illuminant layer 13 grade, the usual screen-stencil, ink jet printing, hot printing printing, gravure, TAMPO printing, spray painting, DIP coating, spin coating, vacuum evaporationo, etc. are used.

[0059]

The blow molding and the vacuum forming with which the size enlargement of a keytop configuration is usually used, press forming, etc. are adopted. In order to lose a location gap of the pattern of a display 2, press forming is good and heats the transparency insulation film 9 to heat deflection temperature except for the field of the display 3, and after holding in the configuration where metal mold was met, an accurate configuration can be acquired if it cools before decompressing. Since the resistance of Conductors T and H tends to rise so that the rate of a drawing is quick, the following is desirably good by 50mm/herafter by 100mm/.

[0060]

[The gestalt 2 of implementation of invention]

Drawing 7 is the important section sectional view of the member for a push button switch concerning the gestalt 2 of implementation of this invention.

[0061]

The member 1 for a push button switch concerning the gestalt 2 of operation shown in drawing 7 forms the display 2 which consists of the encaustic sections, such as an alphabetic character, a sign, or a pattern, and a background of those in the pars intermedia of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0062]

In the member 1 for a push button switch concerning the gestalt 2 of operation So that a traveling contact 7 may be allotted to this stationary contact 6 and the location which counters to compensate for arrangement of the stationary contact 6 on the circuit board 5 2nd resin Plastic solid 25 which is a core material with the press projected part 8 which can press the center section of the dome section 22 of the contact sheet member 23 which formed the traveling contact 7 in the inner surface of the dome section 22 in which elastic deformation is possible, 1st resin Plastic solid 24 fabricated by the keytop configuration of a request of this 2nd resin Plastic solid 25 on the front face (top face) of the wrap transparency insulation film 9 and this transparency insulation film 9 is formed in one, and the transparent electrode 10 is formed in the rear face (underside) of the transparency insulation film 9.

[0063]

The transparency coloring layer 16 which formed the encaustic section of a display 2 in the part which hits a transparent electrode 10 in a rear face at the top panel section of the keytop section 3 in transparent coloring ink is formed. Although a display 2 is formed in a part of top panel section of the keytop section 3, the emitter layer 13 which consists of luminescent material is formed in the rear face of the transparency coloring layer 16, and the rear face of the transparent electrode 10 around the transparency coloring layer 16. Moreover, the back plate 14 by the silver paste is formed in the rear face of the emitter layer 13.

[0064]

In addition, about the ingredient of each part material in the gestalt 2 of operation, since it is the same as that of the gestalt 1 of operation, refer to explanation of the gestalt 1 of operation.

[0065]

Next, the manufacture approach of the member for a push button switch concerning the gestalt 2 of operation is explained.

[0066]

First, the band-like transparent electrode 10 almost equal to the width of face of the top panel of the keytop section 3 is formed in the part in which the keytop section 3 of the rear face of the transparency insulation film 9 is located, and the encaustic sections, such as an alphabetic character of a display 2, a sign, or a pattern, are formed in transparent coloring ink on this transparent electrode 10.

Next, luminescent material is applied on a transparent electrode 10 and the transparency coloring layer 16, and the emitter layer 13 is formed. Next, except for the part which hits in the center of the rear-face section of the keytop section 3 of the emitter layer 13, the insulating ink which has protection-from-light nature and insulation is applied on the periphery section of the emitter layer 13, and a transparent electrode 10, and the opaque coloring layer (insulating layer) 11 is formed. On the emitter layer 13, a back plate 14 is printed as a counterelectrode, and it stops in the printing area of the opaque coloring layer (insulating layer) 11.

[0067]

Next, size enlargement processing which set this printed sheet by the configuration of desired 2nd resin Plastic solid 25 by the compressed air and the vacuum forming, press forming, etc. is performed, and the size enlargement sheet which has the crevice in which 2nd resin Plastic solid 25 used as the core material of the keytop section 3 is formed is created.

[0068]

Next, the configuration of 2nd resin Plastic solid 25 of pouring the thermosetting resin which serves as a core material from on a back plate 14 into the crevice of the size enlargement sheet fabricated by size enlargement processing, and having the press projected part 8 in the center section is molded and stiffened within metal mold, and the member 1 for a push button switch of the condition except 1st resin Plastic solid 24 is completed.

[0069]

Next, to the front-face side of the location where the transparency insulation film 9 in which 2nd resin Plastic solid 25 which is a core material was formed corresponds, adhesion immobilization of 1st resin Plastic solid 24 beforehand formed in the desired keytop configuration is carried out, and the member 1 for a push button switch is completed.

[0070]

since it be maintain at the environment condition by which the emitter layer 13 be isolated from the external ambient atmosphere since the emitter layer 13 be arranged between 1st resin Plastic solid 24 and 2nd resin Plastic solid 25 and be prepared in the location of the pars intermedia of the keytop section 3 , if it be in the gestalt 2 of operation , even if there be no effect receptacle \*\*\*\*\* of oxygen or humidity and it use it for a long period of time , the luminescence engine performance do not fall .

[0071]

[Example]

[Example 1]

An example 1 is equivalent to the gestalt 1 of implementation of this invention.

[0072]

First, one side of a 100-micrometer polymethylmethacrylate coat (AKURIPUREN, product made from Mitsubishi Rayon) was made to distribute 3% of multi-wall nanotube (0.01 micrometers of wire sizes, 5 micrometers of average line length, high peri-on company make) using a homogenizer to the solid content in the Pori (3, 4-ethylene dioxythiophene) (DENATORON 4001, Nagase& Co., Ltd. make) water solution which doped sulfonated polystyrene, and transparent processing liquid was obtained.

[0073]

This processing liquid was completely applied to one side of the transparency insulation film 9 which is a base material film by the gravure coating machine, and the transparent electrode 10 of 1-micrometer thickness was formed. The total light transmission of a transparent electrode 10 was 70% (JIS-K7105), and was surface-electrical-resistance 500ohm/\*\* (JIS-K6911).

[0074]

Next, the background (ground section) of a display 2 was removed in the black insulating coloring ink which has protection-from-light nature for the opaque coloring layer 11, the electrode terminal 28 of a display 2 and a back plate 14 was removed by screen-stencil, and it applied to the whole surface by 5-micrometer thickness.

[0075]

The illuminant 18 of 20-micrometer thickness was printed for inorganic EL paste which made cyanoethyl cellulose distribute the zinc sulfide which has the green luminescent color in the minimum magnitude in the cutting die section 12 of a background (ground section), and the dielectric layer 19 of 10-micrometer thickness which distributed barium titanate powder subsequently to cyanoethyl cellulose was formed.

[0076]

Except for the part and electrode terminal 28 of a dielectric layer 19 used as a back plate 14, the insulating layer 26 of 28-micrometer thickness was formed. The ingredient of an insulating layer 26 used the ink which mixed the 20wt(s)% hollow glass particle (particle size 10, product made from Toshiba PARODINI) for chlorinated polyethylene (super kuron, Nippon Paper Industries Co., Ltd. make).

[0077]

Finally, the conductor H which stands in a row in a back plate 14 and it, and the electrode terminal 28 were formed on the emitter 18 with a silver paste (DODENTO NH-030A, a thermoplastic polyamide binder, product made from Japan Pewter). in addition, the conductor which stands in a row in a transparent electrode 10 — the conductor which stands in a row in T and a back plate 14 — T has opened and arranged spacing in the opaque coloring layer 11 of 5-micrometer thickness.

[0078]

After the above presswork termination, the vacuum dryer could be used, it was made to dry and the printed film was obtained.

[0079] Next, using the metal mold which has 12 mold cavities which have the diameter of 12mm, a depth of 78mm, and a base R50mm concave bend side, and the male which consists of an elastic body of 90 degrees of hardness (Shore A) which carried out templating by this, the metal piece with a diameter of 8mm was put on the display 2 for heat insulation, it heated at 110 degrees C by infrared exposure, the metal piece was removed, and the printed film was promptly pressed between the colds.

[0080]

After removing a male, initial-complement casting of the liquefied silicone rubber of 80 degrees of hardness (Shore A) was carried out as a core material 15, and the press projected part 8 was fabricated to the core material 15 with the 2nd male which has the configuration of the \*\* thickness projected part 8. The traveling contact 7 was formed at the head of the press projected part 8 in the silicone ink containing carbon black, and the member 1 for a push button switch was obtained.

[0081]

When the electrode terminals 27 and 28 of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were connected, it returned under the environment of ordinary temperature normal relative humidity after 500-hour preservation into the elevated-temperature ambient atmosphere of 60 degrees C and 95%RH and 50V and 100Hz were impressed to the highly humid emitter, the display 2 of all the 12 keytop sections 3 presented green luminescence, and brightness was 5.8 nits.

[0082]

[Example 2]

An example 2 is equivalent to the gestalt 2 of implementation of this invention.

[0083]

First, the 15-micrometer ethylene vinyl alcohol copolymer film was laminated as a transparency insulation film 9 which is a base material film to both sides of the 100-micrometer polypropylene film which performed double-sided plasma treatment. The background (ground section) of a display 2 was removed in green opaque coloring ink, the display 2 was removed by screen-stencil, and it applied to the whole surface. Moreover, it is 1/6-mol sulfonation DIN DORIMA (the transparent electrode 10 was formed for the poly ANIN solution containing the dopant to which the benzenesulfonic acid of DIN DORIMA (trade name: DAB8 (PA)) which used the diamino butane and cyanoethylene of a DSM company as starting material was made to react by ink jet printing.) of the structural unit of the poly aniline, the perimeter of a display 2 to the electrode terminal 28 of a transparent electrode 10 showed the conductive polymer ink which mixed solid content [ 75wt(s)% of ] silver dust (made in [ Fukuda Metal Foil & Powder ] a sill coat) for this poly ANIN solution to drawing 4 — as — a conductor — T — lengthening — a time — the bottom. The total light transmission of a transparent electrode 10 was 65% (JIS-K7105), and surface electrical resistance was 700ohm/\*\* (JIS-K56911).

[0084]

With inorganic EL paste which made cyanoethyl cellulose distribute the zinc sulfide which has the blue luminescent color, the emitter 18 with a thickness of 15 micrometers was formed and the dielectric layer 19 was formed like the example 1 so that a transparent electrode 10 might be covered. subsequently, the conductor which stands in a row in a back plate 14 — the conductor which stands in a row in the transparent electrode 10 which intersects H — the bonnet and the insulating layer 26 with a thickness of 15 micrometers were formed on T in the insulating ink which mixed the 25wt(s)% heat-curing acrylic particle (particle size of 8 micrometers, Soken Chemical & Engineering Co., Ltd. make) in polyester (SUTAFIKKUSU, Fuji Photo Film make).

[0085]

In silver mixing conductive polymer ink, the conductor H which stands in a row in a back plate 14 and it, and the electrode terminal 28 were formed. After the above presswork termination, the vacuum dryer could be used, it was made to dry and the printed film was obtained.

[0086]

Using the female mold which has 12 mold cavities with flat 3mmx5mm and base with a depth of 1mm which it has, and the male with which 2.8mmx4.8mm and a top panel with a height of 0.9mm have a flat configuration, the 2.6mmx4.6mm metal piece was put on the display 2 for heat insulation, it heated at 100 degrees C by infrared exposure, the metal piece was removed, and compression molding was promptly performed for the printed film between the colds.

[0087]

After removing a male, initial-complement casting of the liquefied epoxy resin which contains 10wt(s)% iron powder as a deoxidizer was carried out, and the press projected part 8 was fabricated to 2nd resin Plastic solid 25 which is a core material with the 2nd male which has the configuration of the \*\* thickness projected part 8. Furthermore, 1st resin Plastic solid 24 which consists of acrylic resin beforehand fabricated by the request configuration was stuck with 2 acidity-or-alkalinity acrylic adhesives on the front face of the location corresponding to the 2nd resin Plastic solid of the transparency insulation film 9. As it dips in the silanol solution which carries out the mask of the electrode terminals 27 and 28 of the acquired Plastic solid, and makes an amino silanol a catalyst, and is made to dry and react at 40 degrees C, the silica layer of 2-micrometer thickness is formed in a Plastic solid front face and it was shown in drawing 3 or 6, notching 21 was pierced and formed in the flat part between the adjacent keytop section 3 and three comrades with the Thompson mold, and the member 1 for a push button switch was obtained.

[0088]

When the electrode terminals 27 and 28 of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were connected, it returned under the environment of ordinary temperature normal relative humidity after 500-hour preservation into the elevated-temperature ambient atmosphere of 60 degrees C and 95%RH and 50V and 100Hz were impressed to the elevated-temperature emitter, the display 2 of all the 12 keytop sections 3 presented green luminescence, and brightness was 6.5 nits.

[0089]

[The example 1 of a comparison]

Except having removed the insulating layer 26 of 28-micrometer thickness, the thing of the same specification as an example 1 was manufactured, and it considered as the example 1 of a comparison.

[0090]

When the member 1 for a push button switch of the example 1 of a comparison was returned under the environment of ordinary temperature normal relative humidity after 500-hour preservation into the highly humid ambient atmosphere of 60 degrees C and 95% RH and the emitter 18 was made to turn on, the two keytop sections 3 did not light up among 12 pieces, but the brightness was low the about three keytop section far from electrode terminals 27 and 28.

[0091]

[Effect of the Invention]

Since it is placed between the parts with which the conductor which a field emitter has an emitter layer between a transparent electrode and a back plate, and stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap by the insulating layer according to invention indicated by claim 1 as explained above, sufficient insulation of the conductor of a transparent electrode and the conductor of a back plate is secured. The display which carries out uniform luminescence by this is obtained efficiently, and can offer the member for a push button switch which can respond also to small-and-light-izing of a personal digital assistant, densification, and diversification.

[0092]

According to invention according to claim 2, two or more keytop sections are prepared in the base material film which has one insulation at one. Since it is formed in the flat part of the base material film which connects the keytop sections which the stress cutoff section which prevents telling the stress of the base material film produced when any one keytop section is operated to other keytop sections adjoins Since it is lost that the surrounding keytop section malfunctions by the motion of the keytop section which carried out press actuation, in addition to the effectiveness of claim 1, the member for a push button switch which can guarantee more positive switching is completed.

[0093]

According to invention according to claim 3, since the thickness of an insulating layer is at least 10 micrometers or more and it can secure sufficient insulation performance, in addition to claim 1 or the effectiveness of 2, its luminescence quality improves further.

[0094]

According to invention according to claim 4, since the insulating empty capsid contains in the insulating layer and a dielectric constant will fall, when using the illuminant of alternating current actuation, in addition to the effectiveness of claim 3, the convenient member for a push button switch is obtained especially.

[0095]

Since according to invention according to claim 5 the base material film was made to penetrate, the side was wired on the other hand from the one side side in one conductor in the part with which the conductor which stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap and this base material film was made into said insulating layer Since the member for preparing an insulating layer separately in addition to the effectiveness of claim 3 in order to use a base material film as an insulating layer is not needed, manufacture becomes easy and cost reduction can be planned.

[0096]

According to invention of the manufacture approach according to claim 6, on a plane base material film A transparent electrode, Since it was made to carry out size enlargement of the electrode terminal which forms the conductor connected with a transparent electrode in an emitter layer and a back plate list, and the conductor which stands in a row in a back plate, and can be connected with the keytop section and an external electrode after that Since it is possible to prepare an emitter layer in contact with the display of the keytop section with means, such as printing, on a plane base material film, the member for a push button switch from which sufficient insulation of the conductor of a transparent electrode and the conductor of a back plate was secured can be manufactured easily. The display which carries out uniform luminescence by this is obtained efficiently, and can offer the member for a push button switch which can respond also to small-and-light-izing of a personal digital assistant, densification, and diversification.

[Brief Description of the Drawings]

[Drawing 1] It is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of

implementation of this invention.

[Drawing 2] It is the important section expanded sectional view which expanded the top panel section of drawing 1.

[Drawing 3] It is the top view having shown an example of the layout of the conductor in the member for a push button switch concerning the gestalt 1 of this operation.

[Drawing 4] It is a member for a push button switch concerning the gestalt 1 of this operation, and is the important section expanded sectional view having shown the intersection of the conductor which stands in a row in the transparent electrode at the time of adopting an insulating layer independently, and the conductor which stands in a row in a back plate with the transparency insulation film.

[Drawing 5] It is a member for a push button switch concerning the gestalt 1 of this operation, and is the important section expanded sectional view having shown the intersection of the conductor which stands in a row in the transparent electrode at the time of making a transparency insulation film into an insulating layer, and the conductor which stands in a row in a back plate.

[Drawing 6] It is the top view of the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[Drawing 7] It is the important section sectional view having shown the member for a push button switch concerning the gestalt 2 of implementation of this invention.

[Drawing 8] It is the important section sectional view of the member for a push button switch which used the light emitting diode for the conventional light source.

[Drawing 9] It is the important section sectional view of the member for a push button switch which used the electric bulb for the conventional light source.

[Drawing 10] It is the important section sectional view of the member for a push button switch which adopted the conventional light guide section material.

[Drawing 11] It is the important section sectional view of the member for a push button switch which used EL sheet for the conventional light source.

[Description of Notations]

1 Member for Push Button Switch

2 Display

3 Keytop Section

4 Field Emitter

5 Circuit Board

6 Stationary Contact

7 Traveling Contact

8 Press Projected Part

9 Transparency Insulation Film (Base Material Film)

10 Transparent Electrode

11 Opaque Coloring Layer (Insulating Layer)

12 Cutting Die Section

13 Emitter Layer

14 Back Plate

15 Core Material

16 Transparency Coloring Layer (Insulating Layer)

18 Emitter

19 Dielectric Layer

21 Notching (Stress Cutoff Section)

24 1st Resin Plastic Solid

25 2nd Resin Plastic Solid (Core Material)

26 Insulating Printing Layer (Insulating Layer)

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TECHNICAL FIELD

## [Field of the Invention]

This invention is used for input devices, such as personal digital assistants, such as a cellular phone and PDA, telephone, a car stereo, a board computer for mount, an audio, a measuring instrument, a personal computer, and remote control for home theaters, and relates to the member for a push button switch and its manufacture approach of the illumination type which can begin to illuminate a display in more detail in a dark place about the member for a push button switch which has the display which displays each switch function on the keytop section of this input device.

[0002]

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PRIOR ART

## [Description of the Prior Art]

Conventionally, the so-called illumination function in which the member for a push button switch used for this kind of input device illuminates the display which showed the function of a push button switch in the activity at the time of night is needed.

[0003]

For example, it is incorporated in the case of the input device made into the object, and enables it to realize the switch function of the push button switch 30 with the push button switch 30 used for input devices, such as a portable telephone, after the covering base material 32 and the circuit board 33 which formed in one two or more keytop sections 31 which constitute an actuation key have faced each other as shown in drawing 8 or drawing 9. and in the top panel section of the becoming [ each actuation key ] keytop section 31, or the rear-face section, so that the function of the push button switch 30 may be known even in a dark place. The display 34 which gave patterns, such as the alphabetic character and sign according to each switch function, or a pattern, is formed. The content of a display of a display 34 emerges and it can check by looking now because the reflected light which the direct solar radiation emitted from the light source of LED35 or electric bulb 36 grade established on the circuit board 33 and this direct solar radiation reflect and produce in a surrounding member penetrates in the top panel section from the rear-face section of the keytop section 31. Thereby, a cellular phone etc. can be used convenient also in the time of night.

[0004]

Moreover, when more uniform brightness was required, as shown in drawing 10 or drawing 11, the light guide section material 37 on sheet metal was inserted between LED35 and the keytop section 31, and to enlarge luminescence surface area by using the EL (electroluminescence) sheet 38 which carries out field luminescence as the light source was tried.

[0005]

However, the light guide section material 37 which draws the direct solar radiation from the light source and the light source of LED35, an electric bulb 36, and EL sheet 38 grade Since it is arranged in the place distant from the keytop section 31 so that contact actuation with the contact surface 39 on the circuit board 33 and the keytop section 31 may not be checked. It becomes the physical relationship which the light sources 35, 36, and 38, the light guide section material 37, and a display 34 left. If it is when carry out, it compensates the light guide section material 37 or the EL sheet 38 is used, an increase and, the number of LED35 or electric bulbs 36. The case where sufficient quantity of light which checks the content of a display of a display 34 in a dark place could not be supplied although the difficulty of the design by components mark increasing becomes high arose, and it was lacking in the effectiveness.

[0006]

If it was in the portable telephone which carries out cell actuation especially, the low power is called for, to secure sufficient quantity of light by a small number of light sources was desired, but by the conventional approach mentioned above, even if a part of light emitted from the light source could contribute on the check-by-looking disposition of a display 34 but it used big power consumption, conflict that it could not improve had produced visibility.

[0007]

Furthermore, weight increase was to be caused while constraint arose to be unable to make thickness of the push button switch 30 thin, as a result make thin thickness of an input unit or the body of a device, in order to form the light sources 35, 36, and 38 and the light guide section material 37 between the keytop section 31 and the contact surface 39 prepared in the fixed substrate 33 corresponding to this.

[0008]

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EFFECT OF THE INVENTION

## [Effect of the Invention]

Since it is placed between the parts with which the conductor which a field emitter has an emitter layer between a transparent electrode and a back plate, and stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap by the insulating layer according to invention indicated by claim 1 as explained above, sufficient insulation of the conductor of a transparent electrode and the conductor of a back plate is secured. The display which carries out uniform luminescence by this is obtained efficiently, and can offer the member for a push button switch which can respond also to small-and-light-izing of a personal digital assistant, densification, and diversification.

[0092]

According to invention according to claim 2, two or more keytop sections are prepared in the base material film which has one insulation at one. Since it is formed in the flat part of the base material film which connects the keytop sections which the stress cutoff section which prevents telling the stress of the base material film produced when any one keytop section is operated to other keytop sections adjoins. Since it is lost that the surrounding keytop section malfunctions by the motion of the keytop section which carried out press actuation, in addition to the effectiveness of claim 1, the member for a push button switch which can guarantee more positive switching is completed.

[0093]

According to invention according to claim 3, since the thickness of an insulating layer is at least 10 micrometers or more and it can secure sufficient insulation performance, in addition to claim 1 or the effectiveness of 2, its luminescence quality improves further.

[0094]

According to invention according to claim 4, since the insulating empty capsid contains in the insulating layer and a dielectric constant will fall, when using the illuminant of alternating current actuation, in addition to the effectiveness of claim 3, the convenient member for a push button switch is obtained especially.

[0095]

Since according to invention according to claim 5 the base material film was made to penetrate, the side was wired on the other hand from the one side side in one conductor in the part with which the conductor which stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap and this base material film was made into said insulating layer. Since the member for preparing an insulating layer separately in addition to the effectiveness of claim 3 in order to use a base material film as an insulating layer is not needed, manufacture becomes easy and cost reduction can be planned.

[0096]

According to invention of the manufacture approach according to claim 6, on a plane base material film A transparent electrode, Since it was made to carry out size enlargement of the electrode terminal which forms the conductor connected with a transparent electrode in an emitter layer and a back plate list, and the conductor which stands in a row in a back plate, and can be connected with the keytop section and an external electrode after that. Since it is possible to prepare an emitter layer in contact with the display of the keytop section with means, such as printing, on a plane base material film, the member for a push button switch from which sufficient insulation of the conductor of a transparent electrode and the conductor of a back plate was secured can be manufactured easily. The display which carries out uniform luminescence by this is obtained efficiently, and can offer the member for a push button switch which can respond also to small-and-light-izing of a personal digital assistant, densification, and diversification.

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TECHNICAL PROBLEM

## [Problem(s) to be Solved by the Invention]

Then, in order to cancel the above nonconformities, that to which the device which prevents diffusion of light and loss of the quantity of light by the obstruction by preparing the field emitter which carries out spontaneous light to the top panel section of the keytop section like invention indicated by JP,11-232954,A or JP,2000-285760,A, and attaching the light source near the display is performed is known. These fabricate a keytop configuration, after forming the display layer and transparent electrode with which patterns, such as an alphabetic character, a sign, or a pattern, were given to the insulating bright film, an emitter, a dielectric, and a back plate.

[0009]

More specifically, a transparent electrode forms tin oxide INJIU, the thing which formed the ceramic layer for tin oxide or antimony oxide tin by ion sputtering etc. or the transparent conductive ink which carried out distributed mixing of the ceramic powder at transparency insulation resin, and a still more transparent conductive polymer by screen-stencil etc. on a transparency insulation film. In order to obtain efficient luminescence using a silver paste, or carbon paste or a conductive polymer paste, the conductor which stands in a row in each electrode is prepared in a back plate, and it is compensated with conductivity so that sag from a feed terminal to a light-emitting part may not be caused.

[0010]

However, if it was in the member for a push button switch which has a field illuminant near this conventional display, there was a problem that the insulation of environmental stability, the conductor which stands in a row under highly humid especially at a transparent electrode or it, and the conductor which stands in a row in a back plate or it fell.

[0011]

Therefore, the artificer of this invention proposed it being arranged on the flat surface where both differ, and making it not lap from this invention before except the light-emitting part.

[0012]

However, it was physically difficult to wire from small-and-light-izing of the personal digital assistant of these days, densification, and diversification, so that the conductor of a transparent electrode and the conductor of a back plate may not lap, therefore it was difficult to maintain the insulation of a transparent electrode and a back plate, and the problem that it was difficult to acquire good luminescence quality was connoted.

[0013]

Then, it thinks in order to solve the problem of the member for a push button switch of having a field illuminant near the above conventional displays, and sufficient insulation of the conductor of a transparent electrode and the conductor of a back plate is secured, the display which carries out uniform luminescence is obtained efficiently, and this invention makes it the technical problem to offer the member for a push button switch which can respond also to small-and-light-izing of a personal digital assistant, densification, and diversification, and its manufacture approach.

[0014]

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MEANS

## [Means for Solving the Problem]

In order to solve the above-mentioned technical problem, invention according to claim 1 Two or more keytop sections for pressing the traveling contact which counters the stationary contact on the circuit board and is arranged in the direction contacted to said stationary contact, It has a covering base material for allotting this keytop section to a position and attaching on said circuit board. In said keytop section It is the member for a push button switch which has the field illuminant of one in the display which displays a discernment function or a switch function, and this display. Said field emitter has an emitter layer between a transparent electrode and a back plate, and it is characterized by being placed between the parts with which the conductor which stands in a row in a transparent electrode, and the conductor which stands in a row in a back plate lap by the insulating layer.

[0015]

the member which had the thickness which has insulation with the insulating layer here -- meaning -- either of the independent or multiple ingredients -- so-called -- you may be .

[0016]

invention according to claim 2 -- the configuration of claim 1 -- in addition, it is characterized by to be formed in the flat part of said base material film which connects the keytop sections which the stress cutoff section which prevents said two or more keytop sections telling the stress of said base material film produced when it is prepared in the base material film which has one insulation at one and any one keytop section is operated to other keytop sections adjoins.

[0017]

In addition to claim 1 or the configuration of 2, invention according to claim 3 is characterized by the thickness of said insulating layer being at least 10 micrometers or more.

[0018]

In addition to the configuration of claim 3, invention according to claim 4 is characterized by the insulating empty capsid containing at said insulating layer.

[0019]

invention according to claim 5 -- the configuration of claim 3 -- in addition, in the part with which the conductor which stands in a row in said transparent electrode, and the conductor which stands in a row in a back plate lap, in one conductor, said base material film is made to penetrate, on the other hand, a side is wired from an one side side, and it is characterized by making this base material film into said insulating layer.

[0020]

invention according to claim 6 be characterize by carry out size enlargement of the electrode terminal which form the conductor which stand in a row in claim 1 thru/or the conductor which be the manufacture approach of the member for a push button switch one publication 5 either , be connect with said transparent electrode and an emitter layer on said plane base material film , and be connect with said transparent electrode in a back plate list and a back plate , and can be connect with the keytop section and an external electrode after that .

[0021]

## [Embodiment of the Invention]

Hereafter, drawing 1 thru/or drawing 7 explain the gestalt of implementation of this invention.

[0022]

## [The gestalt 1 of implementation of invention]

Drawing 1 is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[0023]

The member 1 for a push button switch concerning the gestalt 1 of operation shown in drawing 1 consists of the encaustic sections, such as an alphabetic character, a sign, or a pattern, and a background of those, forms the display 2 to which the either emits light at least in the top panel section side of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

[0024]

The traveling contact 7 which is made to counter the stationary contact 6 on the circuit board 5, and is arranged is formed in the member 1 for a push button switch. A traveling contact 7 is specifically formed at the head of the press projected part 8 prepared in the center of the rear-face section of the keytop section 3, and the traveling contact 7 enables it to contact to a stationary contact 6 by pressing the keytop section 3 to a circuit board 5 side.

[0025]

It is the periphery section of the keytop section 3. Moreover, between the member 1 for a push button switch, and the circuit board 5 When the covering base material (not shown) of spring materials, such as silicone rubber which formed in one two or more keytop sections 3 allotted to the position, is formed and the keytop section 3 is pressed, some covering base materials carry out elastic deformation to a circuit board 5 side. When a hand is lifted from the keytop section 3, the keytop section 3 enables it to return to the

original location according to the elastic stability of a covering base material.

[0026]

Two or more keytop sections 3 are arranged at the member 1 for a push button switch, it has the complicated configuration of a three dimension from viewpoints, such as human engineering, in many cases, the top panel section of the keytop section 3 serves as the configuration where it upheaved from parts other than keytop section 3, and it projects from opening (not shown) prepared in the case of an input unit. As for a display 2, that with which patterns, such as a figure, an alphabetic character, or a pattern, are adopted, and indicate the discernment function of the keytop section 3 or the switch symbol description of the keytop section 3 to be used. Although these displays 2 are identified according to the color difference of for example, an alphabetic character color (encaustic section) and background colors other than an alphabetic character (ground section), a hue with sufficient visibility will be chosen if needed.

[0027]

The ingredient with which it fills up as a core material 15 which forms the plunger section etc. is chosen from hard or elastic resin and an elastomer, thermoplasticity, thermosetting, a pellet type, or liquefied \*\* -- although the description is not limited, liquefied thermosetting resin is easy to pour in and excellent in respect of the moldability. Injection molding, transfer molding, potting, etc. can perform in formation of the plunger section etc., and it is also possible to it to paste up and prepare what was fabricated beforehand.

[0028] The transparence insulation film 9 which is a base material film is covered by the periphery front face of the member 1 for a push button switch except the rear-face section of <BR> keytop section 3, and the transparent electrode 10 used as one electrode of the field emitter 4 is formed in it in the rear face of this transparence insulation film 9 in the range which reaches the top panel section of the keytop section 3 from the side face of the keytop section 3. The opaque coloring layer 11 which has protection-from-light nature and insulation is formed in the rear face of the transparence insulation film 9 in which the rear face of a transparent electrode 10 and the transparent electrode 10 are not formed.

[0029]

And the cutting die section 12 doubled with gestalten, such as an alphabetic character of a display 2, a sign, or a pattern, is formed in the opaque coloring layer 11. The emitter layer 13 of magnitude slightly smaller than the magnitude of the top panel section of the keytop section 3 including the cutting die section 12 is formed in the rear face of the opaque coloring layer 11. Therefore, the cutting die section 12 will be fill uped with the emitter layer 13, the pattern [ that it consists of an alphabetic character, a sign, or a pattern ] section will be formed, and the design of a display 2 will be completed by the background (ground section) which consists of an opaque coloring layer 11 around this encaustic section and the cutting die section 12. And the back plate 14 which forms another electrode is formed in the rear face of the emitter layer 13.

[0030]

Drawing 2 is the important section expanded sectional view which expanded the top panel section of drawing 1.

[0031]

The transparence coloring layer 16 is contacted and formed in the opaque coloring layer 11, and a part of transparence coloring layer 16 is burying the cutting die section 12 of the opaque coloring layer 11. The anchor coat layer 17 is formed in the rear face of the transparence coloring layer 16, and he is trying to raise the adhesion of the transparence coloring layer 16 and a transparent electrode 10. The anchor coat layer 17 can be omitted when there is a function which raises adhesion with a transparent electrode 10 to the transparence coloring layer 16.

[0032]

the conductor which stands in a row in a back plate 14 in order that it may be made not to make a transparent electrode 10 large beyond the need and it may maintain the insulation with a back plate 14 -- as for H, forming is important so that it may not lap. Between a transparent electrode, 10, and a back plate 14, the emitter 18 and dielectric layer 19 which consist of luminescent material are pinched. It is necessary to form an emitter 18 and a dielectric layer 19 so that a transparent electrode 10 may be covered from the need of maintaining the insulation of a transparent electrode 10 and a back plate 14, in the part with which a transparent electrode 10 and a back plate 14 lap.

[0033]

Although there is a display 2 in the top panel section of the keytop section 3, and this display 2 is not distorted with shaping or is not extended, the part of the side face of the keytop section 3 is most extended by shaping. therefore, the conductor which stands in a row in the conductor T which stands in a row into the part of the side face of the keytop section 3 at the circumference edge of each class, and a transparent electrode 10 and it and a back plate 14, and it -- if there is a part with which H laps, since exfoliation and an open circuit may arise, it must avoid. Moreover, in order to avoid the unexpected open circuit by dispersion in shaping etc., or lifting of resistance, it is very desirable at the stability of luminescence for a transparent electrode 10 and a back plate 14 to boil two or more electric conduction circuits as a redundancy circuit, respectively, and to connect in the direction of a normal mostly.

[0034]

The polyvinyl alcohol whose thickness of the transparence insulation film 9 is about 25-500 micrometers, Polyethylene, polybutylene, polyethylene terephthalate, polyethylenenaphthalate, Polybutylene naphthalate, the poly acrylic, a polycarbonate, polystyrene, Poly FURORO ethylene propylene, poly chloro TORIFURORO ethylene, the poly vinylidene, Polyimide, polyamidoimide, polyether sulphone, polysulfone, Double \*\*\*\* which carried out the lamination of several sorts besides denaturation objects, such as polyphenylene sulfide, a polyamide, polyarylate or a styrene system, a polyester system, a polyamide system thermoplastic elastomer, and those copolymerization objects, an alloy, of films can be used.

[0035]

Moreover, 100-200 degrees C of softening temperatures when formation of a keytop configuration is easy of 50-150-degree C resin are preferably good, and the small thing of gas transparency of the transparence insulation film 9 is desirable. After shaping, forming inorganic oxides, such as oxidization silicon and an aluminum oxide, outside as a gas barrier layer by approaches, such as vacuum deposition and a sol gel process, or forming overcoat layers, such as transparence resin, protect the design of the emitter layer 13 or a display 2, and they are desirable for reinforcement.

[0036]

The transparence coloring layer 16 and the opaque coloring layer 11 have that good which uses elastic resin and an elastic elastomer as a binder, is what mixed the color and the pigment, sticks to the transparence insulation film 9, and is similarly ductile, and it is

desirable to use the same resin. Although the thickness is set to 1–20 micrometers, it is 3 micrometers or more which is easy to prepare by printing etc., and since it is easy to fabricate the one where overall thickness is thinner, 10 micrometers or less are desirable.

[0037]

Into the ingredient used for a transparent electrode 10, polyacetylene, poly para-phenylene, Polypyrrole, the poly thiophene, the poly aniline, polyphenylene vinylene, Poly seleno FEN, the poly azulene, the poly pyrene, the poly carbazole, The polyethylene dioxythiophene which introduced substituents, such as the poly pyridazine, poly naphthylene, the poly fluorenes, those alkylation, and alkoxy-izing, Poly thiylene vinylene, Pori (3 methylthiophene), Pori (3, 4-dimethylthiophene), Pori (3-thiophene-beta-ethane sulfo nail), the poly methyl pyrrole, Conjugated-system conductive polymers, such as Pori (it is a KISHIRU pyrrole to 3), Pori (3-methyl-4-pyrrole carboxylic-acid methyl), poly cyano phenylenevinylene, a poly dimethoxy phenylenevinylene derivative, or a polyisoprene conversion object, are mentioned.

[0038]

Among these, although it has the influence of a dopant, it is extremely stable to oxygen or humidity, and it is transparent and polypyrrole and the poly thiophene with high conductivity, and the poly aniline derivative are desirable.

[0039]

Since resistance sufficient in a conductive polymer simple substance cannot be obtained, it is necessary to dope. As an acceptor, halogens, such as iodine and a bromine, PF5, AsF5, the Lewis acid of BF3 grade, HF, HCl, proton acid and Para toluenesulfonic acid of H2SO4 grade, Organic acids, such as PARAMETOKISHI ethyl toluenesulfonic acid, FeCl3, the transition-metals compound of TiCl4 grade, Alkaline earth metal, such as alkali metal as an organic substance or donors, such as tetracyano dimetan, tetracyano tetraaza naphthalene, and chloranil, such as Li, Na, and K, and calcium, Sr, Ba, etc. is mentioned.

[0040]

In order to raise the stability by temperature and humidity, an electrolyte anion and a cation are avoided, caution is required for a dedope and coordinate bond, copolymerization, etc. with a conductive polymer are [ it is / direction / good and ] an effective approach to immobilization. Especially the thing for which the monomer of AB2 mold is used as a start raw material, and is introduced into oligomer, such as DIN DORIMA which was made to carry out sequential association and was compounded from the core molecule, polystyrene, polymethylmethacrylate, and polyurethane, a polymer, or a fullerene molecule, and a dopant is supported as a functional group is simple, and it is especially desirable from the adhesion to a transparency insulation Plastic solid or a film increasing. Moreover, since the dopant which became many organic functions focusing on such support also becomes carrying out the bridge of between the molecules of a conductive polymer, stabilizing in electric conduction, and lowering resistance, it is dramatically useful. It is better to make it store into a Plastic solid, since the effect of a dedope becomes very small where a conductive polymer is closed.

[0041]

Furthermore, in order to reduce conductivity, a conductive polymer is extended, it is useful to contract the intermolecular distance of a conductive polymer, and it can use the drawing at the time of size enlargement.

[0042]

what formed the ceramic layer for a tin oxide indium, tin oxide, or antimony oxide tin by ion sputtering etc. as other ingredients of a transparent electrode 10 — or

Although the transparent conductive ink which carried out distributed mixing of the ceramic powder at transparency insulation resin is mentioned, when drawing shaping is carried out at a keytop configuration, the treatment of compensating the fault is required by mixing detailed conductive fiber so that resistance may not go up. Since a conductive polymer maintains conductivity until it fractures, it is convenient to this invention accompanied by drawing shaping.

[0043]

If the structure of the emitter layer 13 makes the field of a display 2 emit light to homogeneity and considers compound-ization with the Plastic solid of resin that what is necessary is just to use the mechanism of electric-light conversion, inorganic [ of an organic system / EL ], organic electroluminescence, or LEC (LightEmittingElectrochemicalCell, electrochemical luminescence) is mentioned, also in this, thickness control is easy, there is stability over an environment, and inorganic [ simple / EL ] is suitable.

[0044]

One side [ at least ] which counters forms the about 5–50-micrometer emitter 18 among 2 electrodes (a transparent electrode 10 and base electrode 14) of transparency, and inorganic [ EL ] impresses an alternating current (20–100V, and 50–400Hz), and makes it emit light. It is necessary to carry out pressure up in the case of direct-current cells, such as a pocket device, and to change into an alternating current with an inverter etc.

[0045]

An illuminant 18 can make high dielectric organic substance binders, such as cyanoethyl cellulose, cyano ethyl saccharose, a cyano ethyl pullulan, and cyano ethyl vinyl alcohol, able to distribute inorganic fluorescent substance powder, such as zinc sulfide, can be solution-ized by the acetonitrile, dimethylformamide, dimethylacetamide, etc., and can be processed with wet. Especially, metals, such as copper and iron, are doped to an emitter 18, and multiple color-ization is attained. Moreover, a fluorescent substance is microencapsulated with the ceramics with a sol gel process etc., and what raised moisture resistance is known. When the adhesion and the low moisture permeability not only to luminous efficiency but a base material are searched for, it can be used suitably. In order to paste the transparent electrode 10 which consists of an adhesive low conductive polymer good, it is desirable to use a thing equivalent to the ingredient of an anchor coat.

[0046]

High dielectrics, such as barium titanate and potassium titanate, can be further blended with the binder of a dielectric layer 19, and electric-field effectiveness can be gathered to it. In order to insulate a transparent electrode 10 and a back plate 14, both volume resistivity and thickness are important, the volume resistivity of the 13th power or more of 1 is required of DC100V impression, and at least 10 micrometers is required for thickness. If this insulation falls, since luminescence brightness will become low and luminous efficiency will fall, caution is required. Of course, there must not be no pinhole, mixing of a foreign matter, etc. If high concentration ink, such as non-solvent ink, is used, thickness will be formed at once, the pinhole by solvent volatilization etc. will decrease, and it will be easy to maintain insulation.

[0047]

Although the area of inorganic EL sheet used as a conventional source of sheet-like light is large, since this invention is adopted only as a display 2, that area is set to about 1 / 5 - 1/100, and can reduce power consumption in proportion to it.

[0048]

Although the above-mentioned conductive polymer is sufficient as a transparent electrode 10 and the back plate 14 which counters Metals, such as gold, silver, copper, nickel, palladium, and platinum, an alloy, or tungsten carbide, Others [ particles /, such as silicon carbide, tin oxide, and indium oxide, / conductive / ceramic ], Conductive fillers, such as carbon black and graphite, an epoxy resin, Since ductility becomes high, it is desirable to consider as thermoplastics with big molecular weight, such as the thermosetting resin of low crosslinking density, such as urethane resin and silicone resin, or a polyamide, polyester, the poly acrylic, chlorinated polyolefins, and unvulcanized synthetic rubber, thermoplastic elastomer.

[0049]

The storage modulus in the molding temperature of a binder is smaller than that of a base material and the insulating macromolecule thin film 20 mentioned later, and needs to be in a floating condition earlier than them, and to be extended easily. When dynamic viscoelasticity is measured, as for the storage modulus, it is still more preferably desirable that they are double or less figures a single or less figure. When there is no magnitude of sufficient sample to measure dynamic viscoelasticity, using a micro hardness tester, a sample is in the condition maintained to required temperature, and can distinguish size.

[0050]

The insulating macromolecule thin film 20 which has insulation is formed, and the rear face of the emitter layer 13 which consists of a transparent electrode 10, an emitter 18, a dielectric layer 19, and a back plate 14 is protected electrically.

[0051]

As for the conductors T and H which stand in a row in a transparent electrode 10 or a back plate 14, it is desirable that conductivity is good although the same ingredient as a back plate 14 is used, and, generally a silver paste and carbon paste are used.

[0052]

They are connected with juxtaposition through Conductors T and H, and as shown in drawing 3, in order that the conductors T and H which stand in a row in a transparent electrode 10 or a back plate 14 may maintain two or more keytop sections 3 at same electric potential and may abolish brightness unevenness, except a light-emitting part, it must try to lap in the minimum area to them so that leakage current may not arise.

[0053]

the conductor which stands in a row in a transparent electrode 10 or a back plate 14 since a limitation is in the area which takes about Conductors T and H especially — Comrades T and H will be each other interwoven with. For this reason, in order to give sufficient insulation, it is desirable to prepare an insulating layer among both in insulating ink etc. What was shown in drawing 4 is the example which adopted the insulating printing layer 26 which printed insulating ink etc. as an insulating layer as the part to which Conductor H crosses as Conductor T. Thus, attention must be paid to a pinhole when an insulating layer is formed by printing.

[0054]

a conductor — T and a conductor — both isolation distance in the part which crosses H — if it puts in another way — the thickness of the insulating printing layer (insulating layer) 26 — 10 micrometers or more — more — desirable — 20 micrometers or more — then, it is good. What is necessary is here, to use what raised an overprint or ink solid content, in constituting an insulating layer from an independent member, and also just to carry out thick film screen printing using the thing containing an insulating particle with a big particle size, for example, a glass particle, an acrylic particle, a silicone particle, a styrene particle, etc. It is convenient, especially when an insulating particle is hollow and the emitter of alternating current actuation is used from a dielectric constant falling.

[0055]

Moreover, high insulation can be secured when the transparency insulation film 9 which is a base material film which has insulation is used as an insulating layer. In this case, as shown in drawing 5, the through hole S prepared beforehand is transparency insulation minded [ 9 ]. the conductor which stands in a row in a transparent electrode 10 — T — this conductor — the conductor which stands in a row in the back plate 14 with which while is arranged, it wires and T crosses as it misses from a side to an another side side — by making the transparency insulation film 9 intervene between H the conductor with which the transparency insulation film 9 which is a base material film stands in a row in a transparent electrode 10 — the conductor which stands in a row in T and a back plate 14 — it can be made to function as an insulating layer with H

[0056]

In addition, when adopting the transparency insulation film 9 as an insulating layer, naturally the insulating layer is transparent, but since it becomes opaque by relation with the design of the keytop section 3, it is not limited to either.

[0057]

Moreover, as shown in drawing 3 or 6, when the keytop section 3 is operated, it is required to form notching 21 in the flat part of the transparency insulation film 9 which connects the keytop sections 3 and 3 which the adjoining keytop section 3 stands in a row, and it must be made not to move, therefore adjoin, and to maintain the independence of each keytop section 3. Here, when notching 21 operates any one keytop section 3, it is the stress cutoff section it is made not to get across to the keytop section 3 which the stress produced on the transparency insulation film 9 which is a base material film adjoins, and as long as it can realize the same operation, the configuration of not only this but a slit or others may be used for it.

[0058]

In formation of the opaque coloring layer 11, the transparency coloring layer 16, and illuminant layer 13 grade, the usual screen-stencil, ink jet printing, hot printing printing, gravure, TAMPO printing, spray painting, DIP coating, spin coating, vacuum evaporationo, etc. are used.

[0059]

The blow molding and the vacuum forming with which the size enlargement of a keytop configuration is usually used, press forming, etc. are adopted. In order to lose a location gap of the pattern of a display 2, press forming is good and heats the transparency insulation film 9 to heat deflection temperature except for the field of the display 3, and after holding in the configuration where metal mold was met, an accurate configuration can be acquired if it cools before decompressing. Since the resistance of Conductors T and H tends to rise so that the rate of a drawing is quick, the following is desirably good by 50mm/herafter by 100mm/.

[0060]

## [The gestalt 2 of implementation of invention]

Drawing 7 is the important section sectional view of the member for a push button switch concerning the gestalt 2 of implementation of this invention.

## [0061]

The member 1 for a push button switch concerning the gestalt 2 of operation shown in drawing 7 forms the display 2 which consists of the encaustic sections, such as an alphabetic character, a sign, or a pattern, and a background of those in the pars intermedia of the keytop section 3, and the field emitter 4 which carries out spontaneous light to a display 2 is used for it.

## [0062]

In the member 1 for a push button switch concerning the gestalt 2 of operation So that a traveling contact 7 may be allotted to this stationary contact 6 and the location which counters to compensate for arrangement of the stationary contact 6 on the circuit board 5 2nd resin Plastic solid 25 which is a core material with the press projected part 8 which can press the center section of the dome section 22 of the contact sheet member 23 which formed the traveling contact 7 in the inner surface of the dome section 22 in which elastic deformation is possible, 1st resin Plastic solid 24 fabricated by the keytop configuration of a request of this 2nd resin Plastic solid 25 on the front face (top face) of the wrap transparence insulation film 9 and this transparence insulation film 9 is formed in one, and the transparent electrode 10 is formed in the rear face (underside) of the transparence insulation film 9.

## [0063]

The transparence coloring layer 16 which formed the encaustic section of a display 2 in the part which hits a transparent electrode 10 in a rear face at the top panel section of the keytop section 3 in transparent coloring ink is formed. Although a display 2 is formed in a part of top panel section of the keytop section 3, the emitter layer 13 which consists of luminescent material is formed in the rear face of the transparence coloring layer 16, and the rear face of the transparent electrode 10 around the transparence coloring layer 16. Moreover, the back plate 14 by the silver paste is formed in the rear face of the emitter layer 13.

## [0064]

In addition, about the ingredient of each part material in the gestalt 2 of operation, since it is the same as that of the gestalt 1 of operation, refer to explanation of the gestalt 1 of operation.

## [0065]

Next, the manufacture approach of the member for a push button switch concerning the gestalt 2 of operation is explained.

## [0066]

First, the band-like transparent electrode 10 almost equal to the width of face of the top panel of the keytop section 3 is formed in the part in which the keytop section 3 of the rear face of the transparence insulation film 9 is located, and the encaustic sections, such as an alphabetic character of a display 2, a sign, or a pattern, are formed in transparent coloring ink on this transparent electrode 10.

Next, luminescent material is applied on a transparent electrode 10 and the transparence coloring layer 16, and the emitter layer 13 is formed. Next, except for the part which hits in the center of the rear-face section of the keytop section 3 of the emitter layer 13, the insulating ink which has protection-from-light nature and insulation is applied on the periphery section of the emitter layer 13, and a transparent electrode 10, and the opaque coloring layer (insulating layer) 11 is formed. On the emitter layer 13, a back plate 14 is printed as a counterelectrode, and it stops in the printing area of the opaque coloring layer (insulating layer) 11.

## [0067]

Next, size enlargement processing which set this printed sheet by the configuration of desired 2nd resin Plastic solid 25 by the compressed air and the vacuum forming, press forming, etc. is performed, and the size enlargement sheet which has the crevice in which 2nd resin Plastic solid 25 used as the core material of the keytop section 3 is formed is created.

## [0068]

Next, the configuration of 2nd resin Plastic solid 25 of pouring the thermosetting resin which serves as a core material from on a back plate 14 into the crevice of the size enlargement sheet fabricated by size enlargement processing, and having the press projected part 8 in the center section is molded and stiffened within metal mold, and the member 1 for a push button switch of the condition except 1st resin Plastic solid 24 is completed.

## [0069]

Next, to the front-face side of the location where the transparence insulation film 9 in which 2nd resin Plastic solid 25 which is a core material was formed corresponds, adhesion immobilization of 1st resin Plastic solid 24 beforehand formed in the desired keytop configuration is carried out, and the member 1 for a push button switch is completed.

## [0070]

since it be maintain at the environment condition by which the emitter layer 13 be isolated from the external ambient atmosphere since the emitter layer 13 be arranged between 1st resin Plastic solid 24 and 2nd resin Plastic solid 25 and be prepared in the location of the pars intermedia of the keytop section 3 , if it be in the gestalt 2 of operation , even if there be no effect receptacle \*\*\*\*\* of oxygen or humidity and it use it for a long period of time , the luminescence engine performance do not fall .

## [0071]

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[Translation done.]

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## EXAMPLE

[Example]

[Example 1]

An example 1 is equivalent to the gestalt 1 of implementation of this invention.

[0072]

First, one side of a 100-micrometer polymethylmethacrylate coat (AKURIPUREN, product made from Mitsubishi Rayon) was made to distribute 3% of multi-wall nanotube (0.01 micrometers of wire sizes, 5 micrometers of average line length, high peri-on company make) using a homogenizer to the solid content in the Pori (3, 4-ethylene dioxythiophene) (DENATORON 4001, Nagase& Co., Ltd. make) water solution which doped sulfonated polystyrene, and transparent processing liquid was obtained.

[0073]

This processing liquid was completely applied to one side of the transparency insulation film 9 which is a base material film by the gravure coating machine, and the transparent electrode 10 of 1-micrometer thickness was formed. The total light transmission of a transparent electrode 10 was 70% (JIS-K7105), and was surface-electrical-resistance 500ohm/\*\* (JIS-K6911).

[0074]

Next, the background (ground section) of a display 2 was removed in the black insulating coloring ink which has protection-from-light nature for the opaque coloring layer 11, the electrode terminal 28 of a display 2 and a back plate 14 was removed by screen-stencil, and it applied to the whole surface by 5-micrometer thickness.

[0075]

The illuminant 18 of 20-micrometer thickness was printed for inorganic EL paste which made cyanoethyl cellulose distribute the zinc sulfide which has the green luminescent color in the minimum magnitude in the cutting die section 12 of a background (ground section), and the dielectric layer 19 of 10-micrometer thickness which distributed barium titanate powder subsequently to cyanoethyl cellulose was formed.

[0076]

Except for the part and electrode terminal 28 of a dielectric layer 19 used as a back plate 14, the insulating layer 26 of 28-micrometer thickness was formed. The ingredient of an insulating layer 26 used the ink which mixed the 20wt(s)% hollow glass particle (particle size 10, product made from Toshiba PARODINI) for chlorinated polyethylene (super kuron, Nippon Paper Industries Co., Ltd. make).

[0077]

Finally, the conductor H which stands in a row in a back plate 14 and it, and the electrode terminal 28 were formed on the emitter 18 with a silver paste (DODENTO NH-030A, a thermoplastic polyamide binder, product made from Japan Pewter), in addition, the conductor which stands in a row in a transparent electrode 10 — the conductor which stands in a row in T and a back plate 14 — T has opened and arranged spacing in the opaque coloring layer 11 of 5-micrometer thickness.

[0078]

After the above presswork termination, the vacuum dryer could be used, it was made to dry and the printed film was obtained.

[0079]

Next, using the metal mold which has 12 mold cavities which have the diameter of 12mm, a depth of 78mm, and a base R50mm concave bend side, and the male which consists of an elastic body of 90 degrees of hardness (Shore A) which carried out templating by this, the metal piece with a diameter of 8mm was put on the display 2 for heat insulation, it heated at 110 degrees C by infrared exposure, the metal piece was removed, and the printed film was promptly pressed between the colds.

[0080]

After removing a male, initial-complement casting of the liquefied silicone rubber of 80 degrees of hardness (Shore A) was carried out as a core material 15, and the press projected part 8 was fabricated to the core material 15 with the 2nd male which has the configuration of the \*\* thickness projected part 8. The traveling contact 7 was formed at the head of the press projected part 8 in the silicone ink containing carbon black, and the member 1 for a push button switch was obtained.

[0081]

When the electrode terminals 27 and 28 of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were connected, it returned under the environment of ordinary temperature normal relative humidity after 500-hour preservation into the elevated-temperature ambient atmosphere of 60 degrees C and 95%RH and 50V and 100Hz were impressed to the highly humid emitter, the display 2 of all the 12 keytop sections 3 presented green luminescence, and brightness was 5.8 nits.

[0082]

[Example 2]

An example 2 is equivalent to the gestalt 2 of implementation of this invention.

[0083]

First, the 15-micrometer ethylene vinyl alcohol copolymer film was laminated as a transparency insulation film 9 which is a base material film to both sides of the 100-micrometer polypropylene film which performed double-sided plasma treatment. The background (ground section) of a display 2 was removed in green opaque coloring ink, the display 2 was removed by screen-stencil, and it applied to the whole surface. Moreover, it is 1/6-mol sulfonation DIN DORIMA (the transparent electrode 10 was formed for the poly ANIN

solution containing the dopant to which the benzenesulfonic acid of DIN DORIMA (trade name: DAB8 (PA)) which used the diamino butane and cyanoethylene of a DSM company as starting material was made to react by ink jet printing.) of the structural unit of the poly aniline. the perimeter of a display 2 to the electrode terminal 28 of a transparent electrode 10 showed the conductive polymer ink which mixed solid content [ 75wt(s)% of ] silver dust (made in [ Fukuda Metal Foil & Powder ] a sill coat) for this poly ANIN solution to drawing 4 — as — a conductor — T — lengthening — a time — the bottom. The total light transmission of a transparent electrode 10 was 65% (JIS-K7105), and surface electrical resistance was 700ohm/\*\* (JIS-K56911).

[0084]

With inorganic EL paste which made cyanoethyl cellulose distribute the zinc sulfide which has the blue luminescent color, the emitter 18 with a thickness of 15 micrometers was formed and the dielectric layer 19 was formed like the example 1 so that a transparent electrode 10 might be covered. subsequently, the conductor which stands in a row in a back plate 14 — the conductor which stands in a row in the transparent electrode 10 which intersects H — the bonnet and the insulating layer 26 with a thickness of 15 micrometers were formed on T in the insulating ink which mixed the 25wt(s)% heat-curing acrylic particle (particle size of 8 micrometers, Soken Chemical & Engineering Co., Ltd. make) in polyester (SUTAFIKKUSU, Fuji Photo Film make).

[0085]

In silver mixing conductive polymer ink, the conductor H which stands in a row in a back plate 14 and it, and the electrode terminal 28 were formed. After the above presswork termination, the vacuum dryer could be used, it was made to dry and the printed film was obtained.

[0086]

Using the female mold which has 12 mold cavities with flat 3mmx5mm and base with a depth of 1mm which it has, and the male with which 2.8mmx4.8mm and a top panel with a height of 0.9mm have a flat configuration, the 2.6mmx4.6mm metal piece was put on the display 2 for heat insulation, it heated at 100 degrees C by infrared exposure, the metal piece was removed, and compression molding was promptly performed for the printed film between the colds.

[0087]

After removing a male, initial-complement casting of the liquefied epoxy resin which contains 10wt(s)% iron powder as a deoxidizer was carried out, and the press projected part 8 was fabricated to 2nd resin Plastic solid 25 which is a core material with the 2nd male which has the configuration of the \*\* thickness projected part 8. Furthermore, 1st resin Plastic solid 24 which consists of acrylic resin beforehand fabricated by the request configuration was stuck with 2 acidity-or-alkalinity acrylic adhesives on the front face of the location corresponding to the 2nd resin Plastic solid of the transparency insulation film 9. As it dips in the silanol solution which carries out the mask of the electrode terminals 27 and 28 of the acquired Plastic solid, and makes an amino silanol a catalyst, and is made to dry and react at 40 degrees C, the silica layer of 2-micrometer thickness is formed in a Plastic solid front face and it was shown in drawing 3 or 6, notching 21 was pierced and formed in the flat part between the adjacent keytop section 3 and three comrades with the Thompson mold, and the member 1 for a push button switch was obtained.

[0088]

When the electrode terminals 27 and 28 of the member 1 for a push button switch and the electrode terminal on the circuit board 5 were connected, it returned under the environment of ordinary temperature normal relative humidity after 500-hour preservation into the elevated-temperature ambient atmosphere of 60 degrees C and 95%RH and 50V and 100Hz were impressed to the elevated-temperature emitter, the display 2 of all the 12 keytop sections 3 presented green luminescence, and brightness was 6.5 nits.

[0089]

[The example 1 of a comparison]

Except having removed the insulating layer 26 of 28-micrometer thickness, the thing of the same specification as an example 1 was manufactured, and it considered as the example 1 of a comparison.

[0090]

When the member 1 for a push button switch of the example 1 of a comparison was returned under the environment of ordinary temperature normal relative humidity after 500-hour preservation into the highly humid ambient atmosphere of 60 degrees C and 95% RH and the emitter 18 was made to turn on, the two keytop sections 3 did not light up among 12 pieces, but the brightness was low the about three keytop section far from electrode terminals 27 and 28.

[0091]

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[Translation done.]

## \* NOTICES \*

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3. In the drawings, any words are not translated.

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DESCRIPTION OF DRAWINGS

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## [Brief Description of the Drawings]

[Drawing 1] It is the important section sectional view having shown the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[Drawing 2] It is the important section expanded sectional view which expanded the top panel section of drawing 1.

[Drawing 3] It is the top view having shown an example of the layout of the conductor in the member for a push button switch concerning the gestalt 1 of this operation.

[Drawing 4] It is a member for a push button switch concerning the gestalt 1 of this operation, and is the important section expanded sectional view having shown the intersection of the conductor which stands in a row in the transparent electrode at the time of adopting an insulating layer independently, and the conductor which stands in a row in a back plate with the transparency insulation film.

[Drawing 5] It is a member for a push button switch concerning the gestalt 1 of this operation, and is the important section expanded sectional view having shown the intersection of the conductor which stands in a row in the transparent electrode at the time of making a transparency insulation film into an insulating layer, and the conductor which stands in a row in a back plate.

[Drawing 6] It is the top view of the member for a push button switch concerning the gestalt 1 of implementation of this invention.

[Drawing 7] It is the important section sectional view having shown the member for a push button switch concerning the gestalt 2 of implementation of this invention.

[Drawing 8] It is the important section sectional view of the member for a push button switch which used the light emitting diode for the conventional light source.

[Drawing 9] It is the important section sectional view of the member for a push button switch which used the electric bulb for the conventional light source.

[Drawing 10] It is the important section sectional view of the member for a push button switch which adopted the conventional light guide section material.

[Drawing 11] It is the important section sectional view of the member for a push button switch which used EL sheet for the conventional light source.

## [Description of Notations]

1 Member for Push Button Switch

2 Display

3 Keytop Section

4 Field Emitter

5 Circuit Board

6 Stationary Contact

7 Traveling Contact

8 Press Projected Part

9 Transparency Insulation Film (Base Material Film)

10 Transparent Electrode

11 Opaque Coloring Layer (Insulating Layer)

12 Cutting Die Section

13 Emitter Layer

14 Back Plate

15 Core Material

16 Transparency Coloring Layer (Insulating Layer)

18 Emitter

19 Dielectric Layer

21 Notching (Stress Cutoff Section)

24 1st Resin Plastic Solid

25 2nd Resin Plastic Solid (Core Material)

26 Insulating Printing Layer (Insulating Layer)

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[Translation done.]

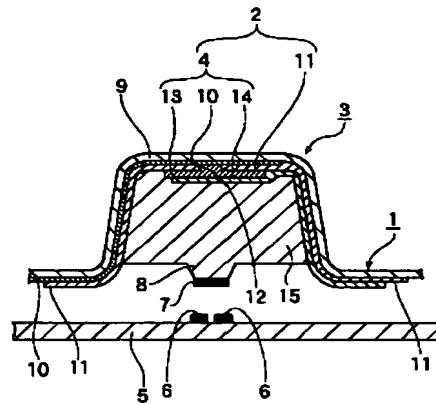
## \* NOTICES \*

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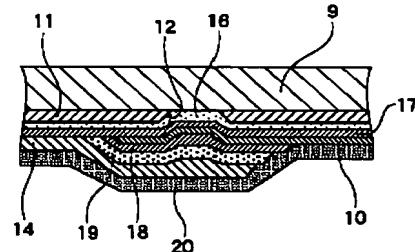
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3. In the drawings, any words are not translated.

## DRAWINGS

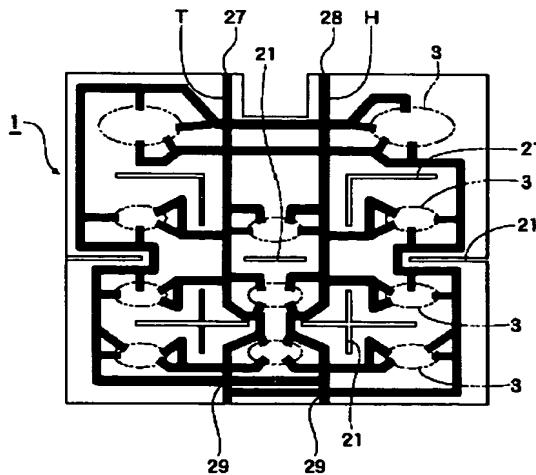
## [Drawing 1]



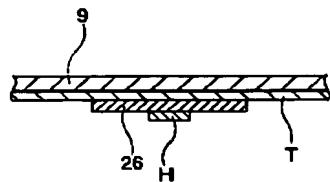
## [Drawing 2]



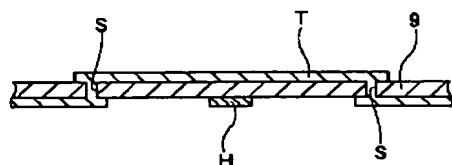
## [Drawing 3]



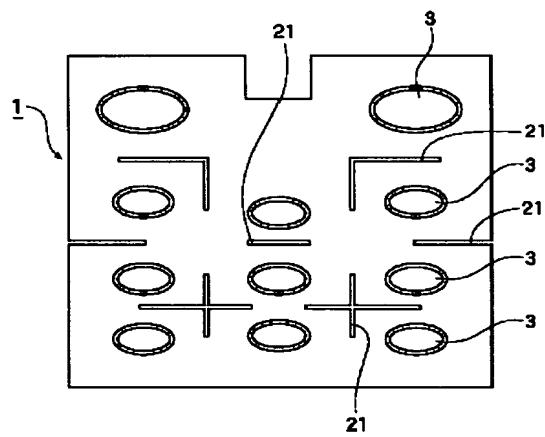
## [Drawing 4]



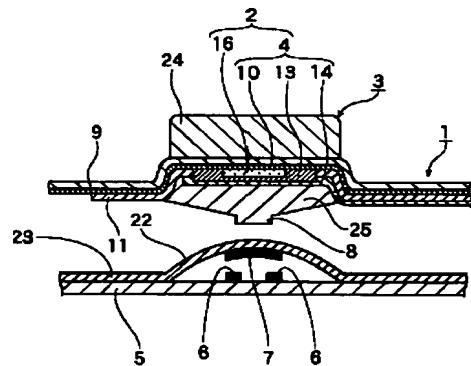
[Drawing 5]



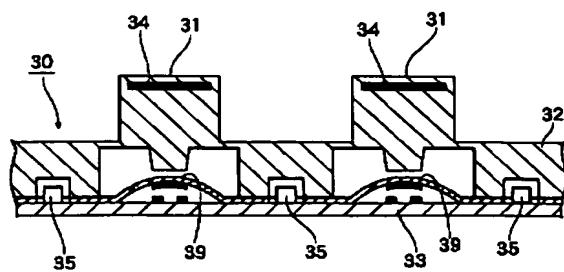
[Drawing 6]



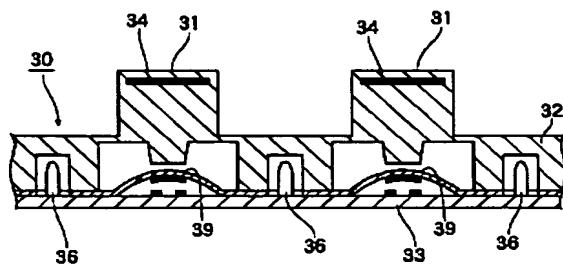
[Drawing 7]



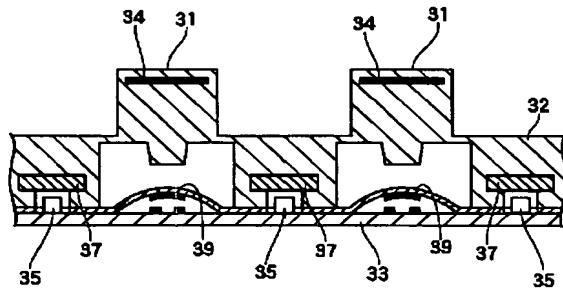
[Drawing 8]



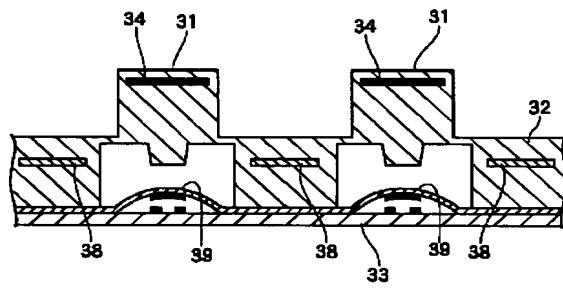
[Drawing 9]



[Drawing 10]



[Drawing 11]



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[Translation done.]

(51) Int.Cl.<sup>7</sup>

HO 1 H 13/02  
HO 1 H 11/00  
HO 1 H 13/14  
HO 1 H 13/70  
// HO 1 H 9/16

F I

HO 1 H 13/02  
HO 1 H 11/00  
HO 1 H 13/14  
HO 1 H 13/70  
HO 1 H 9/16

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5G023 AA12 CA30

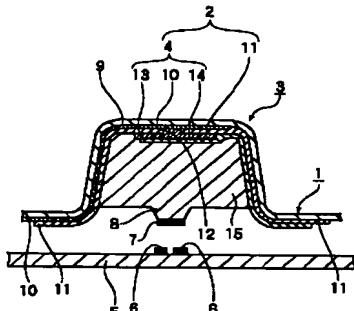
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(54) 【発明の名称】押釦スイッチ用部材とその製造方法

(57) 【要約】

【課題】透明電極の導体と背面電極の導体との十分な絶縁性を確保し、均一な発光をする表示部が効率よく得られ、携帯端末の軽薄短小化、高密度化、多様化にも対応し得る押釦スイッチ用部材とその製造方法を提供する。

【解決手段】回路基板5上の固定接点6に対向して配置される可動接点7を固定接点6に接触させる方向に押圧するための複数のキートップ部3と、該キートップ部3を所定の位置に配して回路基板5上に取り付けるためのカバー基材とを有し、キートップ部3には、識別機能又はスイッチ機能を表示する表示部2と、該表示部2に一体の面発光体4とを有する押釦スイッチ用部材1であって、面発光体4は透明電極10と背面電極14との間に発光体層13を有し、透明電極10に連なる導体Tと背面電極14に連なる導体Hとが重なる部位には絶縁印刷層26を介在させている。



## 【特許請求の範囲】

## 【請求項1】

回路基板上の固定接点に対向して配置される可動接点を前記固定接点に接触させる方向に押圧するための複数のキートップ部と、該キートップ部を所定の位置に配して前記回路基板上に取り付けるためのカバー基材とを有し、前記キートップ部には、識別機能又はスイッチ機能を表示する表示部と、該表示部に一体の面発光体とを有する押釦スイッチ用部材であって、前記面発光体は透明電極と背面電極との間に発光体層を有し、透明電極に連なる導体と背面電極に連なる導体とが重なる部位には絶縁層が介在していることを特徴とする押釦スイッチ用部材。

## 【請求項2】

前記複数のキートップ部は1つの絶縁性を有する基材フィルムに一体に設けられており、いずれか1つのキートップ部を操作したときに生じる前記基材フィルムの応力を他のキートップ部に伝えることを防ぐ応力遮断部が隣接するキートップ部同士を繋ぐ前記基材フィルムの平坦部に形成されていることを特徴とする請求項1に記載の押釦スイッチ用部材。

## 【請求項3】

前記絶縁層の厚みは、少なくとも $10\ \mu\text{m}$ 以上であることを特徴とする請求項1又は2に記載の押釦スイッチ用部材。

## 【請求項4】

前記絶縁層には、絶縁性中空粒子が含有されていることを特徴とする請求項3に記載の押釦スイッチ用部材。

## 【請求項5】

前記透明電極に連なる導体と背面電極に連なる導体とが重なる部位において、一方の導体を前記基材フィルムを貫通させて片面側から他面側へ配線し、該基材フィルムを前記絶縁層としたことを特徴とする請求項3に記載の押釦スイッチ用部材。

## 【請求項6】

請求項1乃至5のいずれか1つに記載の押釦スイッチ用部材の製造方法であって、平面状の前記基材フィルムに前記透明電極、発光体層、背面電極並びに前記透明電極と連なる導体と背面電極に連なる導体とを形成し、その後キートップ部及び外部電極と接続できる電極端子を賦形するようにしたことを特徴とする押釦スイッチ用部材の製造方法。

## 【発明の詳細な説明】

## 【0001】

## 【発明の属する技術分野】

この発明は、携帯電話、PDA等の携帯端末、電話機、カーステレオ、車載用ボードコンピュータ、オーディオ、計測器、パソコンコンピュータ、ホームシアター用リモコン等の入力装置に用いられ、この入力装置のキートップ部にそれぞれのスイッチ機能を表示する表示部

を有する押釦スイッチ用部材に関するものであり、より詳しくは、暗い所で表示部を照らし出すことのできる照光式の押釦スイッチ用部材とその製造方法に関するものである。

## 【0002】

## 【従来の技術】

従来、この種の入力装置に用いられる押釦スイッチ用部材は、夜間時の使用において押釦スイッチの機能を示した表示部を照光するいわゆる照光機能が必要とされている。

## 【0003】

例えば、携帯電話機等の入力装置に使用される押釦スイッチ30では、図8又は図9に示したように、操作キーを構成する複数のキートップ部31を一体に形成したカバー基材32と回路基板33とが向かい合った状態で、目的とする入力装置の筐体内に組み込まれて押釦スイッチ30のスイッチ機能を実現できるようにしている。そして、暗い所でも押釦スイッチ30の機能がわかるように、各々の操作キーとなるキートップ部31の天面部

20 又は裏面部には、それぞれのスイッチ機能に応じた文字、符号又は図柄等の模様を施した表示部34が設けられており、回路基板33上に設けたLED35や電球36等の光源から発せられる直射光及びこの直射光が周辺の部材に反射して生じる反射光がキートップ部31の裏面部から天面部に透過することで、表示部34の表示内容が浮かび上がって視認できるようになっている。これにより、夜間時でも支障なく携帯電話等を使用することができる。

## 【0004】

30 また、より均一な明るさが要求される場合には、図10又は図11に示したように、LED35とキートップ部31との間に薄板上の導光部材37を挿入したり、光源として面発光するEL(エレクトロルミネセンス)シート38を使用することで発光表面積を大きくすることが試みられていた。

## 【0005】

しかしながら、LED35、電球36、ELシート38等の光源及び光源からの直射光を導く導光部材37は、回路基板33上の接点部39とキートップ部31との接觸動作を阻害することのないよう、キートップ部31から離れた所に配置されているため、光源35、36、38や導光部材37と表示部34とが離れた位置関係となり、LED35や電球36の数を増やしたり、導光部材37を補ったり、或いはELシート38を用いた場合にあっては、部品点数が増加することによる設計の困難性が高くなる割には、暗い所で表示部34の表示内容を確認するだけの十分な光量を供給できない場合が生じ、その実効性に乏しかった。

## 【0006】

50 特に、電池駆動する携帯電話機にあっては、低消費電力

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が求められており、少ない数の光源で十分な光量を確保することが望まれるが、上述した従来の方法では光源から発せられる光の一部しか表示部34の視認性向上に寄与できず、大きな消費電力を使用しても視認性を向上することができないといった矛盾が生じていた。

#### 【0007】

さらに、キートップ部31とこれに対応する固定基板33に設けた接点部39の間に、光源35、36、38や導光部材37を設けるため押釦スイッチ30の厚みを薄くすることができず、ひいては入力装置や機器本体の厚みを薄くすることに制約が生じると共に重量の増加を招くこととなっていた。

#### 【0008】

##### 【発明が解決しようとする課題】

そこで、以上のような不具合を解消するため、特開平11-232954号公報又は特開2000-285760号公報に記載された発明のように、キートップ部の天面部に自発光する面発光体を設けて表示部の近傍に光源を取り付けることで、光の拡散と障害物による光量の損失を防ぐ工夫が行われているものが知られている。これらは、絶縁性透明フィルムに文字、符号又は図柄等の模様が施された表示部層、透明電極、発光体、誘電体、背面電極を形成した後、キートップ形状を成形するものである。

#### 【0009】

より具体的には、透明電極は透明絶縁フィルム上に、酸化錫インジウ、酸化錫や酸化アンチモン錫をイオンスペッタリング等でセラミック層を形成したもの、或いはセラミック粉を透明絶縁性樹脂に分散混合した透明導電性インク、さらには透明な導電性高分子をスクリーン印刷等で形成したものである。背面電極には、銀ペーストやカーボンペースト或いは導電性高分子ペーストを用い、効率のよい発光を得るために、給電端子から発光部までの電圧低下をきたさないように、それぞれの電極に連なる導体を設け導電性を補っている。

#### 【0010】

ところが、この従来の表示部の近傍に面発光体を有する押釦スイッチ用部材にあっては、環境安定性、特には、高湿下においては、透明電極或いはそれに連なる導体と、背面電極或いはそれに連なる導体との絶縁性が低下するという問題があった。

#### 【0011】

そのため、この発明の発明者はこの発明より以前に、発光部以外では両者が異なる平面上に配置され、かつ重ならないようにすることを提案した。

#### 【0012】

しかしながら、昨今の携帯端末の軽薄短小化、高密度化、多様化から、透明電極の導体と背面電極の導体とが重ならないように配線することは物理的に難しく、そのため、透明電極と背面電極との絶縁性を維持することが

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難しく、良好な発光品質を得ることが困難であるという問題を内包していた。

#### 【0013】

そこで、この発明は、以上のような従来の表示部の近傍に面発光体を有する押釦スイッチ用部材の問題を解消するために考えられたものであって、透明電極の導体と背面電極の導体との十分な絶縁性を確保し、均一な発光をする表示部が効率よく得られ、携帯端末の軽薄短小化、高密度化、多様化にも対応し得る押釦スイッチ用部材と10その製造方法を提供することを課題としている。

#### 【0014】

##### 【課題を解決するための手段】

上記課題を解決するために、請求項1に記載の発明は、回路基板上の固定接点に対向して配置される可動接点を前記固定接点に接触させる方向に押圧するための複数のキートップ部と、該キートップ部を所定の位置に配して前記回路基板上に取り付けるためのカバー基材とを有し、前記キートップ部には、識別機能又はスイッチ機能を表示する表示部と、該表示部に一体の面発光体とを有する20押釦スイッチ用部材であって、前記面発光体は透明電極と背面電極との間に発光体層を有し、透明電極に連なる導体と背面電極に連なる導体とが重なる部位には絶縁層が介在していることを特徴としている。

#### 【0015】

ここで、絶縁層とは、絶縁性を有する厚みを持った部材を意味し、単独又は複数の材料のいずれからなるものであってもよい。

#### 【0016】

請求項2に記載の発明は、請求項1の構成に加えて、前記複数のキートップ部は1つの絶縁性を有する基材フィルムに一体に設けられており、いずれか1つのキートップ部を操作したときに生じる前記基材フィルムの応力を他のキートップ部に伝えることを防ぐ応力遮断部が隣接するキートップ部同士を繋ぐ前記基材フィルムの平坦部に形成されていることを特徴としている。

#### 【0017】

請求項3に記載の発明は、請求項1又は2の構成に加えて、前記絶縁層の厚みは少なくとも10μm以上であることを特徴としている。

#### 【0018】

請求項4に記載の発明は、請求項3の構成に加えて、前記絶縁層には絶縁性中空粒子が含有されていることを特徴としている。

#### 【0019】

請求項5に記載の発明は、請求項3の構成に加えて、前記透明電極に連なる導体と背面電極に連なる導体とが重なる部位において、一方の導体を前記基材フィルムを貫通させて片面側から他面側へ配線し、該基材フィルムを前記絶縁層としたことを特徴としている。

#### 【0020】

請求項6に記載の発明は、請求項1乃至5いずれか1つに記載の押釦スイッチ用部材の製造方法であって、平面状の前記基材フィルムに前記透明電極、発光体層、背面電極並びに前記透明電極と連なる導体と背面電極に連なる導体とを形成し、その後キートップ部及び外部電極と接続できる電極端子を賦形するようにしたことを特徴としている。

#### 【0021】

##### 【発明の実施の形態】

以下、この発明の実施の形態について図1乃至図7によつて説明する。

#### 【0022】

##### 【発明の実施の形態1】

図1は、この発明の実施の形態1に係る押釦スイッチ用部材を示した要部断面図である。

#### 【0023】

図1に示した実施の形態1に係る押釦スイッチ用部材1は、文字、符号又は図柄等の模様部とその背景部とからなり、少なくともそのいずれか一方が発光する表示部2をキートップ部3の天面部側に設けたものであつて、表示部2に自発光する面発光体4を採用したものである。

#### 【0024】

押釦スイッチ用部材1には、回路基板5上の固定接点6に対向させて配置される可動接点7が設けられている。具体的には、キートップ部3の裏面部中央に設けた押圧突部8の先端に可動接点7を形成し、キートップ部3を回路基板5側へ押圧することにより可動接点7が固定接点6へ接触できるようにしている。

#### 【0025】

また、キートップ部3の外周部でかつ押釦スイッチ用部材1と回路基板5との間には、所定の位置に配された複数のキートップ部3を一体に形成したシリコーンゴム等の弾性材料のカバー基材(図示せず)が設けられており、キートップ部3を押圧した際にカバー基材の一部が回路基板5側に弾性変形して、キートップ部3から手を離した際にカバー基材の弾性復元力によりキートップ部3が元の位置に復帰できるようにしている。

#### 【0026】

押釦スイッチ用部材1には複数のキートップ部3が配置されており、人間工学等の観点から、3次元の複雑な形状を有している場合が多く、キートップ部3の天面部は、キートップ部3以外の部分より隆起した形状となり、入力装置の筐体に設けられた開口部(図示せず)から突出している。表示部2は数字、文字又は図柄等の模様が採用され、キートップ部3の識別機能又はキートップ部3のスイッチ機能の説明を示すものが使われる。これら表示部2は、例えば文字色(模様部)と文字以外の背景色(地部)との色差によって識別されるが、必要に応じて視認性のよい色合いが選択されることとなる。

#### 【0027】

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プランジャー部等を形成する芯材15として充填される材料は、硬質又は軟質の樹脂や、エラストマーから選ばれる。熱可塑性又は熱硬化性、或いはペレット状又は液状等その性状を限定するものではないが、液状熱硬化性樹脂は注入作業が容易であり成形性の点で優れている。プランジャー部等の形成には、射出成形、トランスファー成形、ポッティング等によって行うことができ、予め成形したもの接着して設けることも可能である。

#### 【0028】

10 キートップ部3の裏面部を除いた押釦スイッチ用部材1の外周表面には、基材フィルムである透明絶縁性フィルム9が被覆されており、この透明絶縁性フィルム9の裏面にはキートップ部3の側面からキートップ部3の天面部に達する範囲で、面発光体4の一方の電極となる透明電極10が設けられている。透明電極10の裏面及び透明電極10が設けられていない透明絶縁性フィルム9の裏面には、遮光性及び絶縁性を有する不透明着色層11が設けられている。

#### 【0029】

20 そして、不透明着色層11には表示部2の文字、符号又は図柄等の形態に合わせた抜き型部12が形成されている。不透明着色層11の裏面には、抜き型部12を含めたキートップ部3の天面部の大きさより僅かに小さな大きさの発光体層13を設けている。したがって、抜き型部12は発光体層13で埋められ、文字、符号又は図柄等からなる模様部が形成され、この模様部と抜き型部12の周囲の不透明着色層11からなる背景部(地部)とによって表示部2のデザインが完成されることになる。そして、発光体層13の裏面には、もう一方の電極を形成する背面電極14を設けている。

#### 【0030】

図2は、図1の天面部を拡大した要部拡大断面図である。

#### 【0031】

不透明着色層11には透明着色層16が接触して設けられており、透明着色層16の一部が不透明着色層11の抜き型部12を埋めている。透明着色層16の裏面にはアンカーコート層17が設けられており、透明着色層16と透明電極10との密着性を高めるようにしている。

40 アンカーコート層17は、透明着色層16に透明電極10との密着性を高める機能がある場合には省略することができる。

#### 【0032】

透明電極10は必要以上に大きくすることのないようにすべきであり、背面電極14との絶縁を保つために、背面電極14に連なる導体Hとは重なることがないよう、形成することが肝要である。透明電極と10と背面電極14との間には、発光材料からなる発光体18と誘電体層19とが挟まれている。発光体18と誘電体層19は透明電極10と背面電極14の絶縁性を保つ必要か

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ら、透明電極10と背面電極14が重なる部分においては、透明電極10を覆うように形成する必要がある。

【0033】

キートップ部3の天面部には表示部2があり、この表示部2が成形によって歪んだり延伸されることはないが、キートップ部3の側面の部分が成形により最も延伸される。そのため、キートップ部3の側面の部分に各層の周辺端部や、透明電極10とそれに連なる導体T及び背面電極14とそれに連なる導体Hが重なる部分があつては、剥離、断線が生じることになり兼ねないので、避けなければならない。また、成形のばらつき等による不慮の断線或いは抵抗値の上昇を避けるために、冗長回路として、複数の導電回路を透明電極10と背面電極14のそれぞれにほぼ法線方向に接続することは、発光の安定性に大変好ましい。

【0034】

透明絶縁性フィルム9は、厚みが25～500μm程度のポリビニルアルコール、ポリエチレン、ポリブチレン、ポリエチレンテレフタレート、ポリエチレンナフタレート、ポリブチレンナフタレート、ポリアクリル、ポリカーボネート、ポリスチレン、ポリフロロエチレンプロピレン、ポリクロロトリフロロエチレン、ポリビニリデン、ポリイミド、ポリアミドイミド、ポリエーテルスルホン、ポリスルホン、ポリフェニレンサルファイド、ポリアミド、ポリアリレート、或いはスチレン系、ポリエステル系、ポリアミド系熱可塑エラストマーや、それらの共重合物、アロイ等の変性物の他、数種のフィルムをラミネーションした複層品等が使用できる。

【0035】

また、透明絶縁性フィルム9は、キートップ形状の形成が容易な、軟化点が100～200℃、好ましくは50～150℃の樹脂がよく、ガス透過の小さいものが望ましい。成形後、外側に酸化珪素、酸化アルミニウム等の無機酸化物を蒸着法、ゾルゲル法等の方法でガスバリアー層として形成することや、透明樹脂等のオーバーコート層を形成することは、発光体層13や表示部2の意匠を保護し、長寿命化にとって好ましい。

【0036】

透明着色層16と不透明着色層11は、軟質の樹脂やエラストマーをバインダーにし、染料や顔料を混合したもので、透明絶縁性フィルム9に密着し、同じく延伸性のあるものがよく、同様の樹脂を用いることが好ましい。その厚みは1～20μmとされるが、印刷等で設けやすい3μm以上で、全厚の薄い方が成形しやすいことから、10μm以下が好ましい。

【0037】

透明電極10に用いられる材料には、ポリアセチレン、ポリパラフェニレン、ポリピロール、ポリチオフェン、ポリアニリン、ポリフェニレンビニレン、ポリセレノフェン、ポリアズレン、ポリピレン、ポリカルバゾール、

ポリピリダジン、ポリナフチレン、ポリフルオレンやそれらのアルキル化やアルコキシル化等の置換基を導入したポリエチレンジオキシチオフェン、ポリチエニレンビニレン、ポリ(3メチルチオフェン)、ポリ(3,4-ジメチルチオフェン)、ポリ(3-チオフェン- $\beta$ -エタンスルフォネール)、ポリメチルピロール、ポリ(3-ヘキシルピロール)、ポリ(3-メチル-4-ピロールカルボン酸メチル)、ポリシアノフェニレンビニレン、ポリジメトキシフェニレンビニレン誘導体、或いはポリイソブレン変成物等の共役系導電性高分子が挙げられる。

【0038】

このうち、ドーパントの影響もあるが、酸素や湿度に安定性が高く、透明性があり導電性が高い、ポリピロール、ポリチオフェン、ポリアニリン誘導体が好ましい。

【0039】

導電性高分子単体では、十分な抵抗を得ることができないため、ドーピングする必要があり、アクセプターとしてヨウ素、臭素等のハロゲン、PF<sub>5</sub>、AsF<sub>5</sub>、BF<sub>3</sub>等のルイス酸、HF、HCl、H<sub>2</sub>SO<sub>4</sub>等のプロトン酸やパラトルエンスルホン酸、パラメトキシエチルトルエンスルホン酸等の有機酸、FeCl<sub>3</sub>、TiCl<sub>4</sub>等の遷移金属化合物、テトラシアノジメタン、テトラシアノテトラアザナフタレン、クロラニル等の有機物質或いはドナーとしてのLi、Na、K等のアルカリ金属、Ca、Sr、Ba等のアルカリ土類金属等が挙げられる。

【0040】

温度、湿度による安定性を高めるため、脱ドープには注意が必要で、電解質アニオン、カチオンは避ける方がよく、導電性高分子との配位結合や共重合等は固定に対し有効な方法である。特に、ドーパントをAB2型のモノマーを出発原料とし、中心核分子から順次結合させて合成されたデンドリマーやポリスチレン、ポリメチルメタクリレート、ポリウレタン等のオリゴマー、ポリマー或いはフラーレン分子に導入し、官能基として担持することは簡便であり、透明絶縁性成形体やフィルムへの密着性が高まることから、特に望ましい。また、このような担体を中心に多官能となったドーパントは、導電的に

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は、導電性高分子の分子間をブリッジさせ、安定化し抵抗を下げるにもなるため、非常に有用である。導電性高分子が封止された状態では脱ドープの影響は非常に小さくなるので、成形体中に収めるようにする方がよい。

【0041】

さらに、導電性を低下させるためには、導電性高分子を延伸し、導電性高分子の分子間距離を縮めることは有用で、賦形時の延伸を利用することができる。

【0042】

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透明電極10の他の材料としては、酸化錫インジウム、

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酸化錫や酸化アンチモン錫をイオンスパッタリング等でセラミック層を形成したもの、或いはセラミック粉を透明絶縁性樹脂に分散混合した透明導電性インク等も挙げられるが、キートップ形状に延伸成形されるときに、抵抗が上昇してしまうことがないように、微細な導電性繊維を混合することによりその欠点を補う等の処置が必要である。導電性高分子は破断するまで導電性を維持するので、延伸成形を伴うこの発明には好都合である。

## 【0043】

発光体層13の構造は、電気-光変換のメカニズムを利用すればよく、表示部2の領域を均一に発光させ、樹脂の成形体との複合化を考えると、有機系の無機EL、有機EL或いはLEC (Light Emission EL electrochemical Cell、電気化学発光) 等が挙げられ、この中でも膜厚制御が容易で、環境に対する安定性があり簡便な無機ELが適している。

## 【0044】

無機ELは対向する少なくとも一方が透明の2電極（透明電極10とベース電極14）間に、約5～50μmの発光体18を設け、20～100V、50～400Hzの交流を印加して発光させる。携帯機器等の直流電池の場合には、インバーター等によって昇圧し、交流に変換する必要がある。

## 【0045】

発光体18は、硫化亜鉛等の無機蛍光体粉末をシアノエチルセルロース、シアノエチルサッカロース、シアノエチルプルラン、シアノエチルビニルアルコール等の高誘電体有機物バインダーに分散させ、アセトニトリル、ジメチルホルムアミド、ジメチルアセトアミド等で溶液化し、湿式にて加工を施すことができる。特に、発光体18には銅、鉄等の金属をドーピングし多色化が図られている。また、蛍光体をゾルゲル法等により、セラミックスでマイクロカプセル化し、耐湿性を高めたものが知られている。発光効率だけでなく基材への密着性や低い透湿性が求められる場合は、適宜使用することができる。接着性の低い導電性高分子からなる透明電極10に、良好に接着するためには、アンカーコートの材料と同等のものを用いることが望ましい。

## 【0046】

誘電体層19のバインダーには、チタン酸バリウム、チタン酸カリウム等の高誘電体をさらに配合し、電界効率を上げることができる。透明電極10と背面電極14とを絶縁するには、両者の体積抵抗と膜厚が重要で、DC 100V印加で1の13乗以上の体積抵抗が必要で、膜厚は少なくとも10μmは必要である。この絶縁性が低下すると、発光輝度が低くなり、発光効率が落ちるので注意が必要である。勿論、ピンホールや異物の混入等があつてはならない。無溶剤インク等の高濃度インクを用いると、一度に膜厚が形成され、溶剤揮発によるピンホ

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ール等が低減し、絶縁性を維持しやすい。

## 【0047】

従来の面状光源として用いられる無機ELシートの面積は広いが、この発明は表示部2のみに採用するため、その面積は約1/5～1/100となり、それに比例して消費電力を低減することができる。

## 【0048】

透明電極10と対向する背面電極14は、前述の導電性高分子でもかまわないが、金、銀、銅、ニッケル、パラ

ジウム、白金等の金属又は合金、或いはタンゲステンカーバイト、炭化珪素、酸化スズ、酸化インジウム等の導電性セラミックス微粒子の他、カーボンブラック、グラファイト等の導電性フィラーをエポキシ樹脂、ウレタン樹脂、シリコーン樹脂等の低架橋密度の熱硬化性樹脂、或いはポリアミド、ポリエチル、ポリアクリル、塩素化ポリオレフィンや未加硫合成ゴム、熱可塑性エラストマー等の分子量の大きな熱可塑性樹脂とすることは延伸性が高くなるので好ましい。

## 【0049】

20バインダーの成形温度における貯蔵弾性率は、基材及び後述する絶縁性高分子薄膜20のそれより小さく、それより早く流動状態となり、容易に延伸されることが必要である。動的粘弾性を測定すると、その貯蔵弾性率は1桁以下、さらに好ましくは2桁以下であることが好ましい。動的粘弾性を測定するのに十分な試料の大きさがない場合は、微小硬度計を用い、試料が必要な温度に維持した状態で、大小の判別を行うことができる。

## 【0050】

透明電極10、発光体18、誘電体層19及び背面電極30 14からなる発光体層13の裏面は絶縁性を有する絶縁性高分子薄膜20が形成され、電気的に保護されている。

## 【0051】

透明電極10又は背面電極14に連なる導体T、Hは、背面電極14と同じ材料が用いられるが、導電性がよいことが好ましく、一般には銀ペースト、カーボンペーストが用いられる。

## 【0052】

透明電極10又は背面電極14に連なる導体T、Hは、40図3に示したように、複数のキートップ部3を同電位に保ち、輝度むらをなくすため、導体T、Hを介して並列に繋がれており、発光部以外では、リーク電流が生じないように、最小限の面積で重なるように努めなければならない。

## 【0053】

特に、導体T、Hを引き回す面積に限界があるので、透明電極10又は背面電極14に連なる導体同士T、Hが交錯してしまう。このため、十分な絶縁性を与えるために、絶縁性インク等で絶縁層を両者の間に設けることが望ましい。図4に示したものは、導体Tと導体Hとが交

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差する部位に、絶縁層として絶縁性インク等を印刷した絶縁印刷層26を採用した例である。このように、絶縁層を印刷で形成した場合は、ピンホールに注意を払わなければならない。

【0054】

導体Tと導体Hとが交差する部位における両者の隔絶距離、言い換えると絶縁印刷層（絶縁層）26の厚みは10μm以上、より望ましくは20μm以上とすればよい。ここで、絶縁層を単独の部材で構成する場合には重ね印刷、若しくはインク固形分を高めたものを使用するほか、粒径の大きな絶縁性粒子、例えばガラス粒子、アクリル粒子、シリコーン粒子、スチレン粒子等を含有するものを用いて厚膜印刷すればよい。絶縁性粒子が中空であった場合は、誘電率が低下することから、交流駆動の発光体を用いるときには、特に好都合である。

【0055】

また、絶縁性を有する基材フィルムである透明絶縁性フィルム9を絶縁層として用いた場合には、高い絶縁性を確保することができる。この場合は、図5に示したように、透明絶縁性フィルム9に予め設けたスルーホールSを介して、透明電極10に連なる導体Tをこの導体Tが配置される一方の側から他方の側へ逃がすようにして配線し、交差する背面電極14に連なる導体Hとの間に透明絶縁性フィルム9を介在させることで、基材フィルムである透明絶縁性フィルム9が透明電極10に連なる導体Tと背面電極14に連なる導体Hとの絶縁層として機能させることができる。

【0056】

なお、透明絶縁性フィルム9を絶縁層として採用する場合には、絶縁層は当然透明であるが、キートップ部3の意匠との関係で不透明となることもあり、いずれかに限定されるものではない。

【0057】

また、図3又は6に示したように、キートップ部3を操作したときに、隣接するキートップ部3が連なって動くことのないようにしなければならず、そのため隣接するキートップ部同士3、3を繋ぐ透明絶縁性フィルム9の平坦部に切り欠き21を設け、個々のキートップ部3の独立性を保つことが必要である。ここで、切り欠き21は、いずれか1つのキートップ部3を操作した際に基材フィルムである透明絶縁性フィルム9に生じる応力が隣接するキートップ部3に伝わらないようにする応力遮断部であって、同様の作用を実現できるものであればこれに限らず、例えばスリットやその他の構成を採用してもよい。

【0058】

不透明着色層11、透明着色層16、発光体層13等の形成に当たっては、通常のスクリーン印刷、インクジェット印刷、熱転写印刷、グラビア印刷、タンポ印刷、吹き付け塗装、ディップコーティング、スピンドルコーティング

グ、蒸着等を用いる。

【0059】

キートップ形状の賦形は、通常用いられる、ブロー成形、真空成形、プレス成形等が採用される。表示部2の模様の位置ずれをなくすためには、プレス成形がよく、透明絶縁性フィルム9を、その表示部3の領域を除いて、熱変形温度に加熱し、金型に沿った形状に保持した後、除圧前に冷却すると精度のよい形状を得ることができる。延伸の速度が速いほど、導体T、Hの抵抗値が上昇しやすいため、100mm/分以下、望ましくは50mm/分以下がよい。

【0060】

【発明の実施の形態2】

図7は、この発明の実施の形態2に係る押釦スイッチ用部材の要部断面図である。

【0061】

図7に示した実施の形態2に係る押釦スイッチ用部材1は、文字、符号又は図柄等の模様部とその背景部とからなる表示部2をキートップ部3の中間部に設けたもので20あって、表示部2に自発光する面発光体4を採用したものである。

【0062】

実施の形態2に係る押釦スイッチ用部材1には、回路基板5上の固定接点6の配置に合わせてこの固定接点6と対向する位置に可動接点7を配するように弾性変形可能なドーム部22の内面に可動接点7を設けた接点シート部材23のドーム部22の中央部を押圧できる押圧突部8を有した芯材である第2樹脂成形体25と、この第2樹脂成形体25を覆う透明絶縁性フィルム9と、この透明絶縁性フィルム9の表面（上面）に所望のキートップ形状に成形された第1樹脂成形体24とが一体に設けられており、透明絶縁性フィルム9の裏面（下面）には、透明電極10が形成されている。

【0063】

透明電極10に裏面には、キートップ部3の天面部に当たる箇所に透明な着色インクで表示部2の模様部を形成した透明着色層16が形成されている。表示部2はキートップ部3の天面部の一部分に形成されるが、透明着色層16の裏面及び透明着色層16の周囲の透明電極10の裏面には、発光材料からなる発光体層13が設けられている。また、発光体層13の裏面には銀ペーストによる背面電極14が設けられている。

【0064】

なお、実施の形態2における各部材の材料については、実施の形態1と同様であるため、実施の形態1の説明を参照のこと。

【0065】

次に、実施の形態2に係る押釦スイッチ用部材の製造方法について説明する。

【0066】

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まず、透明絶縁性フィルム9の裏面のキートップ部3が位置する箇所に、キートップ部3の天面の幅とほぼ等しい帯状の透明電極10を形成し、この透明電極10の上に透明な着色インクで表示部2の文字、符号又は図柄等の模様部を形成する。次に、発光材料を透明電極10及び透明着色層16の上に塗布して発光体層13を形成する。次に、発光体層13のキートップ部3の裏面部中央に当たる箇所を除いて、遮光性及び絶縁性を有する絶縁性インクを発光体層13の外周部と透明電極10の上に塗布して不透明着色層（絶縁層）11を形成する。発光体層13の上には対向電極として背面電極14を印刷し、不透明着色層（絶縁層）11の印刷エリア内に留める。

## 【0067】

次に、この印刷済みシートを圧空・真空成形やプレス成形等により所望の第2樹脂成形体25の形状に合わせた賦形加工を行い、キートップ部3の芯材となる第2樹脂成形体25が設けられる凹部を有する賦形シートを作成する。

## 【0068】

次に、賦形加工によって成形された賦形シートの凹部に背面電極14の上から芯材となる熱硬化性樹脂を注入して中央部に押圧突部8を有する第2樹脂成形体25の形状を金型内で造形し硬化させて、第1樹脂成形体24を除いた状態の押釦スイッチ用部材1を完成する。

## 【0069】

次に、芯材である第2樹脂成形体25を形成した透明絶縁性フィルム9の対応する位置の表面側に、予め所望のキートップ形状に形成した第1樹脂成形体24を接着固定して、押釦スイッチ用部材1を完成する。

## 【0070】

実施の形態2にあっては、発光体層13が第1樹脂成形体24と第2樹脂成形体25との間に配置されキートップ部3の中間部の位置に設けられているため、発光体層13が外部雰囲気からより隔離された環境状態に保たれているため、酸素や湿度の影響受けることがなく長期に使用しても発光性能が低下することがない。

## 【0071】

## 【実施例】

## 【実施例1】

実施例1は、この発明の実施の形態1に対応するものである。

## 【0072】

まず、 $100\mu\text{m}$ のポリメチルメタクリレートコート（アクリルレン、三菱レーヨン（株）製）の片面にスルホン化ポリスチレンをドーピングしたポリ（3,4-エチレンジオキシチオフェン）（デナトロン4001、長瀬産業（株）製）水溶液にその固形分に対し3%のマルチウォールナノチューブ（線径 $0.01\mu\text{m}$ 、平均長 $5\mu\text{m}$ 、ハイペリオン社製）を、ホモジナイザーを用い

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分散させ透明な処理液を得た。

## 【0073】

この処理液を基材フィルムである透明絶縁性フィルム9の片面にグラビアコーティングにより全面塗布し、 $1\mu\text{m}$ 厚の透明電極10を形成した。透明電極10の全光線透過率は70%（JIS-K7105）で、表面抵抗500Ω/□（JIS-K6911）であった。

## 【0074】

次に、不透明着色層11を遮光性を有する絶縁性の黒色10の着色インクで表示部2の背景部（地部）をスクリーン印刷で、表示部2及び背面電極14の電極端子28を除き全面に $5\mu\text{m}$ 厚で塗布した。

## 【0075】

緑色の発光色を有する硫化亜鉛をシアノエチルセルロースに分散させた無機ELペーストを背景部（地部）の抜き型部12に最小限の大きさで $20\mu\text{m}$ 厚の発光体18を印刷し、次いでチタン酸バリウム粉末をシアノエチルセルロースに分散させた $10\mu\text{m}$ 厚の誘電体層19を設けた。

## 20 【0076】

背面電極14となる誘電体層19の部分及び電極端子28を除き、 $28\mu\text{m}$ 厚の絶縁層26を設けた。絶縁層26の材料は、塩素化ポリエチレン（スーパークリン、日本製紙（株）製）に $20\text{wt\%}$ の中空ガラス粒子（粒径10、東芝パロディーニ製）を混合したインクを使用した。

## 【0077】

最後に、銀ペースト（ドーデントNH-030A、熱可塑性ポリアミドバインダー、ニホンハンダ（株）製）で30 発光体18上に背面電極14とそれに連なる導体H及び電極端子28を設けた。なお、透明電極10に連なる導体Tと背面電極14に連なる導体Tとは $5\mu\text{m}$ 厚の不透明着色層11で間隔をあけて配置した。

## 【0078】

以上の印刷工程終了後、真空乾燥装置でよく乾燥させ印刷済みフィルムを得た。

## 【0079】

次に、直径 $12\text{mm}$ 、深さ $78\text{mm}$ 、底面R $50\text{mm}$ の凹曲面を有する12個のキャビティーを有する金型と、これにより型取りした硬度90度（ショア-A）の弾性体からなる雄型を用い、表示部2に断熱のため直径 $8\text{mm}$ の金属片を置き、赤外線照射により $110^\circ\text{C}$ に加熱し、金属片を取り去り直ちに、印刷済みフィルムを冷間で圧縮成形した。

## 【0080】

雄型を取り除いた後、芯材15として硬度80度（ショア-A）の液状シリコーンゴムを必要量注型し、押厚突部8の形状を有する第2の雄型により、芯材15に押圧突部8を成形した。押圧突部8の先端にカーボンブラックを含有するシリコーンインクにより可動接点7を形成

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し、押釦スイッチ用部材1を得た。

【0081】

押釦スイッチ用部材1の電極端子27、28と回路基板5上の電極端子とを接続し、60℃、95%RHの高温雰囲気中に500時間保存後、常温常湿の環境下に戻し、高湿発光体に50V、100Hzを印加すると、12個すべてのキートップ部3の表示部2は緑色の発光を呈し、輝度は5.8ニットであった。

【0082】

【実施例2】

実施例2は、この発明の実施の形態2に対応するものである。

【0083】

まず、基材フィルムである透明絶縁性フィルム9として、両面プラズマ処理を施した100μmのポリプロピレンフィルムの両面に15μmのエチレンビニルアルコールコポリマー/フィルムをラミネートした。緑色の不透明着色インクで表示部2の背景部(地部)をスクリーン印刷で、表示部2を除き全面に塗布した。その上に、ポリアニリンの構造単位の1/6モルのスルホン化デンドリマー(DSM社のジアミノブタンとシアノエチレンを出発物質としたデンドリマー(商品名:DAB(PA)8)のベンゼンスルホン酸を反応させたドーパントを含むポリアニン溶液をインクジェット印刷により透明電極10を形成した。このポリアニン溶液を固形分の7.5wt%の銀粉(シルコート、福田金属箔粉工業(株)製)を混合した導電性ポリマーインクを表示部2の周囲から透明電極10の電極端子28まで、図4に示したように導体Tを引き回した。透明電極10の全光線透過率は65%(JIS-K7105)で、表面抵抗は700Ω/□(JIS-K56911)であった。

【0084】

青色の発光色を有する硫化亜鉛をシアノエチルセルロースに分散させた無機ELペーストにより、透明電極10を覆うように、厚さ15μmの発光体18を形成し、実施例1と同様に誘電体層19を設けた。次いで、背面電極14に連なる導体Hと交差する透明電極10に連なる導体T上に、ポリエステル(スタフィックス、富士写真フィルム(株)製)に25wt%の熱硬化アクリル粒子(粒径8μm、総研化学(株)製)を混合した絶縁性インクで覆い、厚さ15μmの絶縁層26を形成した。

【0085】

銀混合導電性ポリマーインクで、背面電極14とそれに連なる導体H及び電極端子28を形成した。以上の印刷工程終了後、真空乾燥装置でよく乾燥させ印刷済みフィルムを得た。

【0086】

3mm×5mm、深さ1mmの底面が平坦な有する12個のキャビティーを有する雌型と2.8mm×4.8mm、高さ0.9mmの天面が平坦な形状を有する雄型を

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用い、表示部2に断熱のため2.6mm×4.6mmの金属片を置き、赤外線照射により100℃に加熱し、金属片を取り去り直ちに、印刷済みフィルムを冷間で圧縮成形を行った。

【0087】

雄型を取り除いた後、酸素除去剤として10wt%の鉄粉を含む液状エポキシ樹脂を必要量注型し、押厚突部8の形状を有する第2の雄型により、芯材である第2樹脂成形体25に押圧突部8を成形した。さらに、透明絶縁性フィルム9の第2樹脂成形体に対応する位置の表面上に、予め所望形状に成形されたアクリル樹脂からなる第1樹脂成形体24を二液性アクリル接着剤で貼着した。

得られた成形体の電極端子27、28をマスクして、アミノシラノールを触媒とするシラノール溶液に浸し、40℃で乾燥、反応させ、成形体表面に2μm厚のシリカ層を形成し、図3又は6に示したように、隣り合うキートップ部3、3同士の間の平坦な部分に切り欠き21をトムソン型にて打ち抜き形成し、押釦スイッチ用部材1を得た。

【0088】

押釦スイッチ用部材1の電極端子27、28と回路基板5上の電極端子とを接続し、60℃、95%RHの高温雰囲気中に500時間保存後、常温常湿の環境下に戻し、高湿発光体に50V、100Hzを印加すると、12個すべてのキートップ部3の表示部2は緑色の発光を呈し、輝度は6.5ニットであった。

【0089】

【比較例1】

28μm厚の絶縁層26を除いた以外は実施例1と同じ仕様のものを製作し、比較例1とした。

【0090】

比較例1の押釦スイッチ用部材1を60℃、95%RHの高温雰囲気中に500時間保存後、常温常湿の環境下に戻し、発光体18を点灯させたところ、12個のうち2箇所のキートップ部3が点灯せず、電極端子27、28から遠いキートップ部3ほどその明るさが低かった。

【0091】

【発明の効果】

以上説明してきたように、請求項1に記載された発明によれば、面発光体は透明電極と背面電極との間に発光体層を有し、透明電極に連なる導体と背面電極に連なる導体とが重なる部位には絶縁層が介在しているので、透明電極の導体と背面電極の導体との十分な絶縁性を確保される。これにより、均一な発光をする表示部が効率よく得られ、携帯端末の軽薄短小化、高密度化、多様化にも対応し得る押釦スイッチ用部材を提供することができる。

【0092】

請求項2に記載の発明によれば、複数のキートップ部は1つの絶縁性を有する基材フィルムに一体に設けられて

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おり、いずれか1つのキートップ部を操作したときに生じる基材フィルムの応力を他のキートップ部に伝えることを防ぐ応力遮断部が隣接するキートップ部同士を繋ぐ基材フィルムの平坦部に形成されているので、押圧操作したキートップ部の動きによって周辺のキートップ部が誤動作するがなくなるため、請求項1の効果に加え、より確実なスイッチングが保証できる押釦スイッチ用部材が完成される。

## 【0093】

請求項3に記載の発明によれば、絶縁層の厚みは少なくとも10μm以上であるので、十分な絶縁性能を確保することができるため、請求項1又は2の効果に加え、発光品質が一層向上する。

## 【0094】

請求項4に記載の発明によれば、絶縁層には絶縁性中空粒子が含有されているので、誘電率が低下することとなるから、請求項3の効果に加え、交流駆動の発光体を用いるときに特に好都合な押釦スイッチ用部材が得られる。

## 【0095】

請求項5に記載の発明によれば、透明電極に連なる導体と背面電極に連なる導体とが重なる部位において、一方の導体を基材フィルムを貫通させて片面側から他面側へ配線し、該基材フィルムを前記絶縁層としたので、基材フィルムを絶縁層として利用するため、請求項3の効果に加え、別途絶縁層を設けるための部材を必要としないため、製造が容易となりコスト低減を図ることができる。

## 【0096】

請求項6に記載の製造方法の発明によれば、平面状の基材フィルムに透明電極、発光体層、背面電極並びに透明電極と連なる導体と背面電極に連なる導体とを形成し、その後キートップ部及び外部電極と接続できる電極端子を賦形するようにしたので、平面状の基材フィルムの上に発光体層を印刷等の手段によりキートップ部の表示部に接して設けることが可能であるから、透明電極の導体と背面電極の導体との十分な絶縁性が確保された押釦スイッチ用部材を容易に製造することができる。これにより、均一な発光をする表示部が効率よく得られ、携帯端末の軽薄短小化、高密度化、多様化にも対応し得る押釦スイッチ用部材を提供することができる。

## 【図面の簡単な説明】

【図1】この発明の実施の形態1に係る押釦スイッチ用部材を示した要部断面図である。

【図2】図1の天面部を拡大した要部拡大断面図である。

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【図3】同実施の形態1に係る押釦スイッチ用部材における導体のレイアウトの一例を示した平面図である。

【図4】同実施の形態1に係る押釦スイッチ用部材であって、透明絶縁フィルムとは別に絶縁層を採用した場合の透明電極に連なる導体と背面電極に連なる導体との交差部を示した要部拡大断面図である。

【図5】同実施の形態1に係る押釦スイッチ用部材であって、透明絶縁フィルムを絶縁層とした場合の透明電極に連なる導体と背面電極に連なる導体との交差部を示した要部拡大断面図である。

【図6】この発明の実施の形態1に係る押釦スイッチ用部材の平面図である。

【図7】この発明の実施の形態2に係る押釦スイッチ用部材を示した要部断面図である。

【図8】従来の光源に発光ダイオードを使用した押釦スイッチ用部材の要部断面図である。

【図9】従来の光源に電球を使用した押釦スイッチ用部材の要部断面図である。

【図10】従来の導光部材を採用した押釦スイッチ用部材の要部断面図である。

【図11】従来の光源にELシートを使用した押釦スイッチ用部材の要部断面図である。

## 【符号の説明】

|    |                   |
|----|-------------------|
| 1  | 押釦スイッチ用部材         |
| 2  | 表示部               |
| 3  | キートップ部            |
| 4  | 面発光体              |
| 5  | 回路基板              |
| 6  | 固定接点              |
| 7  | 可動接点              |
| 8  | 押圧突部              |
| 9  | 透明絶縁性フィルム（基材フィルム） |
| 10 | 透明電極              |
| 11 | 不透明着色層（絶縁層）       |
| 12 | 抜き型部              |
| 13 | 発光体層              |
| 14 | 背面電極              |
| 15 | 芯材                |
| 16 | 透明着色層（絶縁層）        |
| 18 | 発光体               |
| 19 | 誘電体層              |
| 21 | 切り欠き（応力遮断部）       |
| 24 | 第1樹脂成形体           |
| 25 | 第2樹脂成形体（芯材）       |
| 26 | 絶縁印刷層（絶縁層）        |

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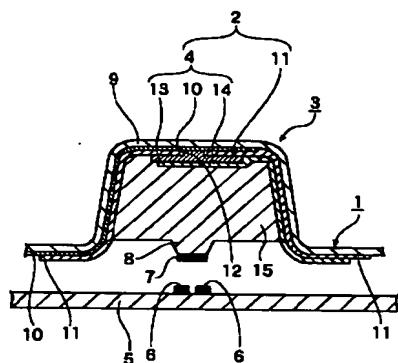
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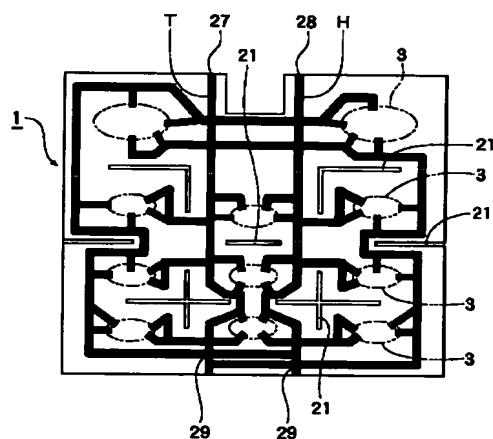
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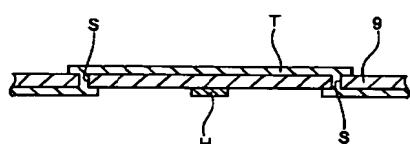
【図 1】



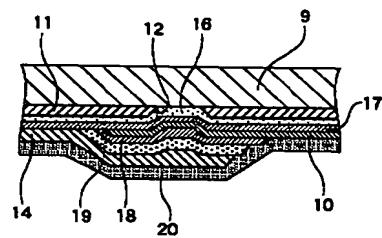
### 【图3】



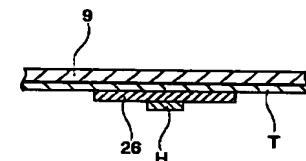
【图 5】



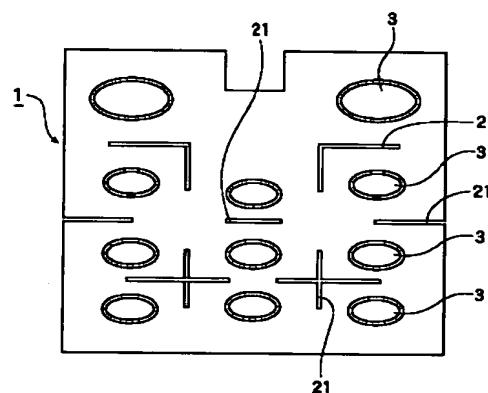
【四】



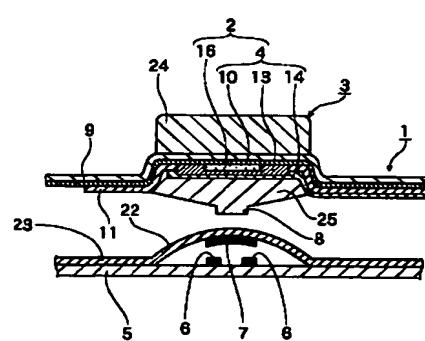
【図4】



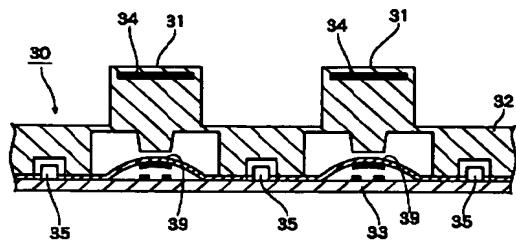
【四六】



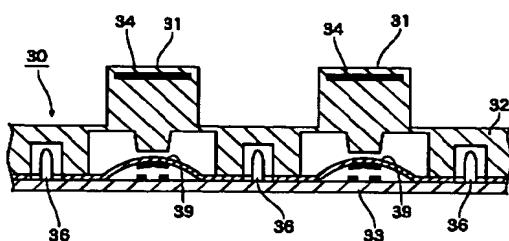
【図7】



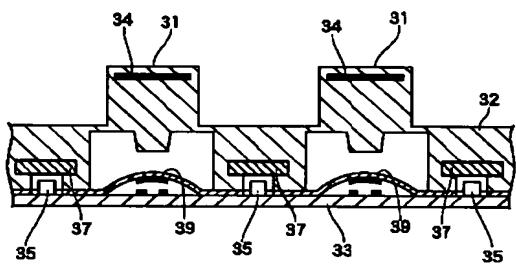
【図8】



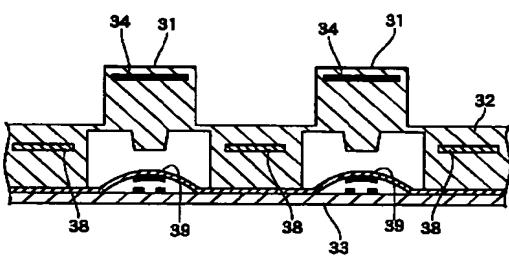
【図9】



【図10】



【図11】



フロントページの続き

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JB08